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From: Air Chief Marshal P.C. Lal, D.F.C.

AIR HEADQUARTERS
NEW DELHI

FOREWORD

Aviation is now an essential part of our daily life. Almost all long distance mails, many millions of passengers and much valuable cargo travel by air in our country these days. In mountainous areas, where roads and railways are difficult to build, aircraft are the principal means of transport. Elsewhere, even where road and rail services are good, air transport links together distant places and speeds up travel between them.

Aircraft are also vital to our defence. The Indian Air Force uses fighters, bombers, transports and helicopters for a variety of tasks. The fighters can fly faster than the speed of sound, some even twice as fast, in order to intercept hostile aircraft. Transport aircraft and helicopters of the IAF carry passengers and supplies in many parts of Assam, NEFA, Nagaland and Ladakh. They also bring aid to victims of natural disasters, such as floods and earthquakes.

Our aircraft industry has also grown rapidly in recent years. It now makes several types of aircraft for military and civilian use. It employs large numbers of highly trained men, and quite a number of women, to produce these aircraft.

We can be sure that aviation will continue to play an increasingly important part in the life of our nation. It is therefore time to begin teaching our children about it. That is what this short and simple book sets out to do. I hope it will be read and enjoyed by young readers and their parents.

P. C. LAL
Air Chief Marshal

15th December 1970

STATE INSTITUTE OF EDUCATION
West Bengal

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I acknowledge the help rendered by the people in collecting material, diagrams and photographs, in revising and making suggestions for the book and typing the manuscript. Without mentioning names, I thank you all.

AUTHOR

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1 | Story of a Little Boy

THIS IS the story of a five-year-old boy who lived in a small town in India about twenty years ago. One day, as he went out to play in the garden, he heard a very odd sound. He looked all around, but could not understand where the sound was coming from. Then suddenly he saw something flying high up in the sky. It did not look like any of the birds that he had seen before. It was very big and grey in colour. He kept staring at the sky and very soon he could see it no more.

For several days afterwards, whenever he went to the garden to play, he would hear the same sound and would see the same big bird in the sky. He began to enjoy hearing the sound and then searching the sky to find the bird.

Soon he began to hear the same sound more often during the day and would run out to see if the big bird was there. He would throw away his toys if he was playing, leave his food uneaten and would sometimes get up from his sleep. This began to happen day after day and no one could stop him. At night he could never see his big bird, instead he used to see little coloured lights. Of course, he never knew if these lights belonged to his bird or not. This became a game for him.

His mother and father began to get tired of his behaviour. They told him that the big bird was called an aeroplane. He had never seen an aeroplane from close and did not know what it looked like.

The questions he asked his parents were never ending. They would get tired and scold him. Even at school, the teacher stopped answering his questions as the class-work would remain undone. No one could understand his wish to know more about the aeroplane.

When he was about ten years old, he made up his mind to work by himself and to find out all he wanted to know. He began to spend more time in the school library, trying to look through books and magazines. These were very difficult for him to read; so he would just look at the photographs and pictures.

As time passed he got busy with his studies and never had enough time to run out and look at the sky. Whenever he heard the sound of an aeroplane, the wish to study hard and learn more would become stronger. He grew up into a big intelligent boy and at last he was able to find the answers to many of his questions.

At that time India had to fight a war with her neighbour, China. He would hear over the radio and read in the newspapers and the magazines about the Air Force planes. He could not understand all the names, nor could he understand how the Air Force was fighting. He wanted to learn more about the fighting planes.

So he began to study again. Some years later India had to fight yet another war. This war was with her other neighbour, Pakistan. This time whenever he heard the news or read anything, he could understand it all. He was really very happy.

I am sure there must be several children among you, who like the boy in the story, have many times seen and heard an aeroplane. Many of you must have seen it at an airfield. Some of you must have even travelled in it. But, I am sure, most of you have not been able to find the answers to many questions which come to your mind. I am going to help you to find out these answers by telling you all you want to know about aeroplanes.

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2 | First Attempts at Flying

YOU HAVE all seen birds flying. For thousands of years men watched the birds and wondered how they had this marvellous gift of flying. Looking at these birds, man first began dreaming about going up in the sky. Men tried to copy these birds. They tried various methods but could not fly. They tried to make big kites which could carry them up. It may sound stupid to you now, but they even tried jumping from high places, wearing some kind of artificial wings. They thought that these wings would help them to stay in the air like the birds. Everytime they tried something like this, they got hurt. None of the methods they tried was of any use.

One winter night, a man was sitting near the fire. While looking at the fire he saw smoke rising from it. The man watching the smoke wondered if the smoke could also take other things up with it. He thought for some time and then made a bag of silk and burnt some paper below it. As soon as the smoke collected in the bag it started rising up.

You can also try this. Take an ordinary paper bag and hold it over the rising smoke from a fire. After a few minutes, leave the bag and you will see that it will rise.

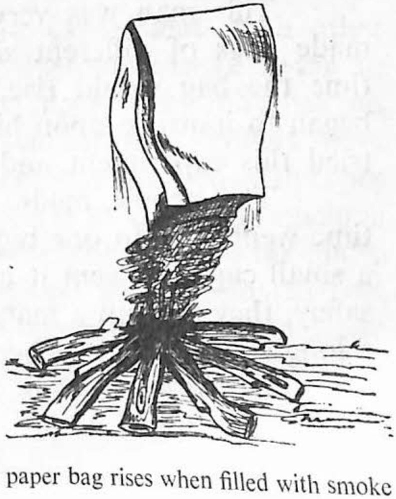


Fig. 1. A paper bag rises when filled with smoke

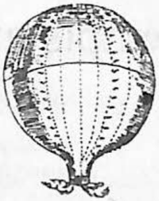


Fig. 2. The first balloon.

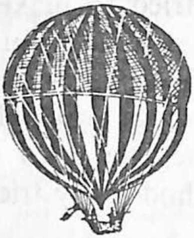


Fig. 4. Balloons became popular

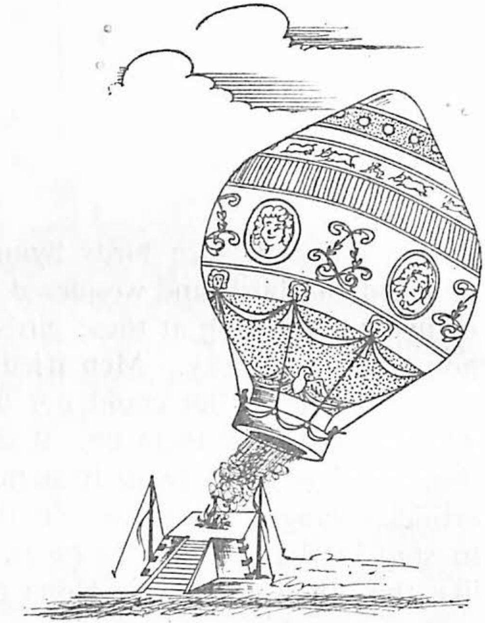


Fig. 3. Men were sent up in balloons after animals returned safely

This man was very happy when he saw the bag rise. He made bags of different sizes and with different materials. Every time the bag would rise, he would feel very happy. Slowly, he began to improve upon his experiments. Several other people also tried this experiment and were successful.

The people made bigger and bigger bags like balloons as time went by. In one big balloon they put two or three animals in a small cage and sent it up in the air. When the animals returned safely, they sent up a man in a balloon. The balloon was tied with a long rope at the end because they were afraid that the man might get hurt. After this was successful, a man was sent up without any rope tied to the balloon. Slowly the number of men in the balloon began to increase.

Improvements began to take place and the balloons could stay in the air much longer. They could also travel for fairly long distances. Very soon the balloons could fly in the air for many days and people could take extra food, clothing and scientific instruments with them.

Balloons could fly only in the direction in which the wind blew. No one could think of a way to make these go in a different direction. Often, these balloons would hit high trees, buildings or mountains. The people were not satisfied.

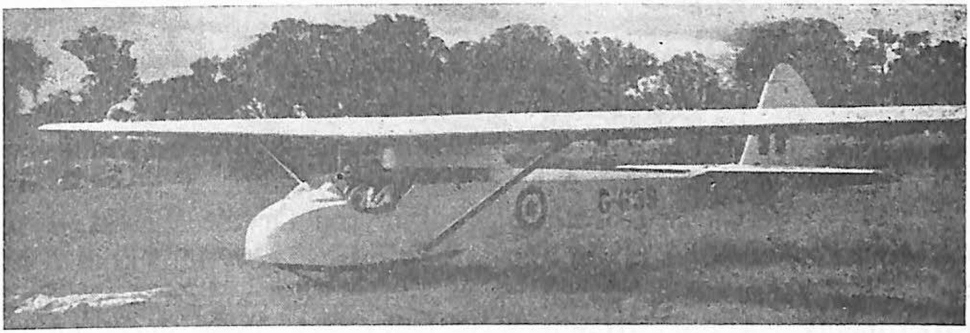


Fig. 5. A glider

Some people were also trying to experiment with other methods of flying in the air. One new method was of flying in gliders. A glider is like a present day aeroplane, but has no machine or engine. It has wings. In earlier days gliders were sent down from high places. These days gliders are tied with ropes and pulled by jeep. The rope may be pulled by a special machine called a winch, or may be towed by an aeroplane. When the glider is pulled, the air hits its wings and the glider soon begins to rise. When it reaches a certain height the rope is dropped and the glider floats in the air and comes down to the ground gradually after some time. Unlike balloons, the pilot of a glider can control the direction of travel but the glider can stay up only as long as the

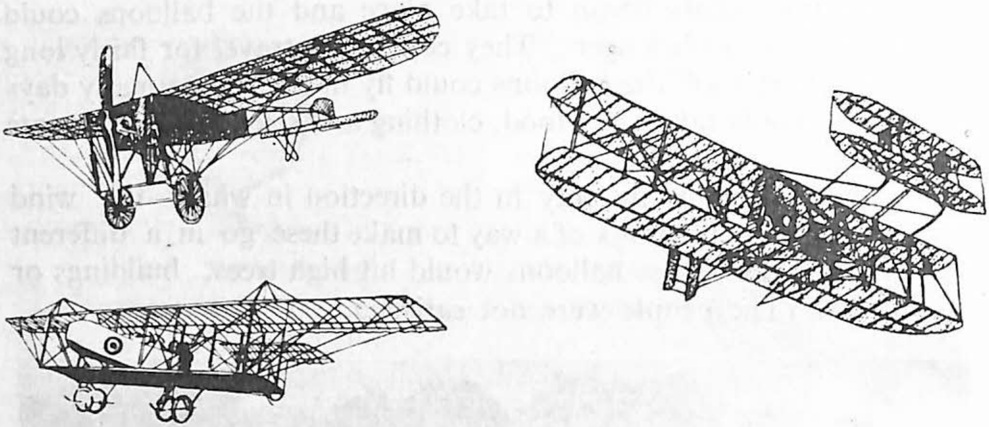


Fig. 6 (a), (b), (c). Some early machines

currents of air can support it. Most glider flights are for a few minutes but at times they can be for a few hours.

In America two brothers, Wilbur and Orville Wright, were carrying out experiments at the same time. They were known as the "Wright Brothers". They worked hard, and tried several experiments. About sixty-nine years ago (1903), they were able to make a machine which could fly in the air.

Although the first really successful flight took place in 1903, an Italian named Leonardo da Vinci had thought of a rough form of an aeroplane more than five hundred years ago.

The first machine was not very good. Before showing it to the people many improvements had to be made. The people were

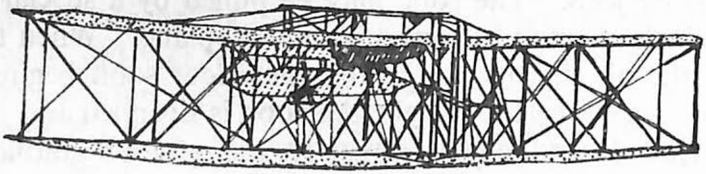


Fig. 7. Wright Brothers' first machine

delighted to see the machine fly. The public gradually began to take interest in these machines.

A competition was held to fly between two cities. These cities were about two hundred miles away from each other. The winners got a prize which would be equal to several thousand rupees. This distance was flown in about twenty-four hours, which today takes less than half an hour.

The Wright Brothers opened schools to teach flying to people. This made people more interested. Some people joined the Wright Brothers to build machines while others tried experimenting on their own. The machines improved and were built in larger and larger numbers.

3 | Aeroplanes in War

At this time, the First World War started. Some of the countries which took part in the war were Austria, Germany, England and Russia. You will learn more about this when you grow up.

I will only tell you that at this time the people did not understand fully how aeroplanes could help them in a war. Many governments did not want to spend money to buy them. Balloons were used for getting information about the enemy's position and helping the artillery firing by giving them the correct direction. Towards the end of the war people started using aeroplanes.

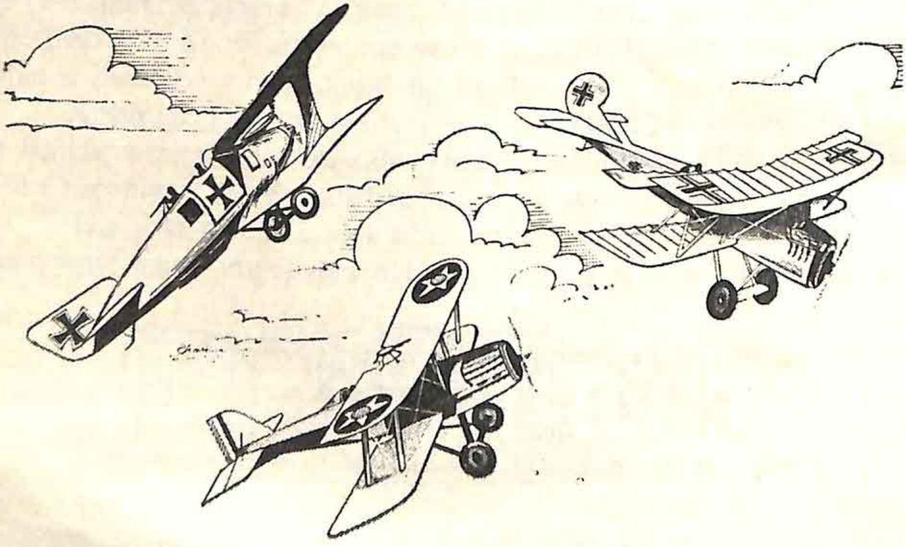


Fig. 8 (a), (b), (c). Some aeroplanes used in World War I

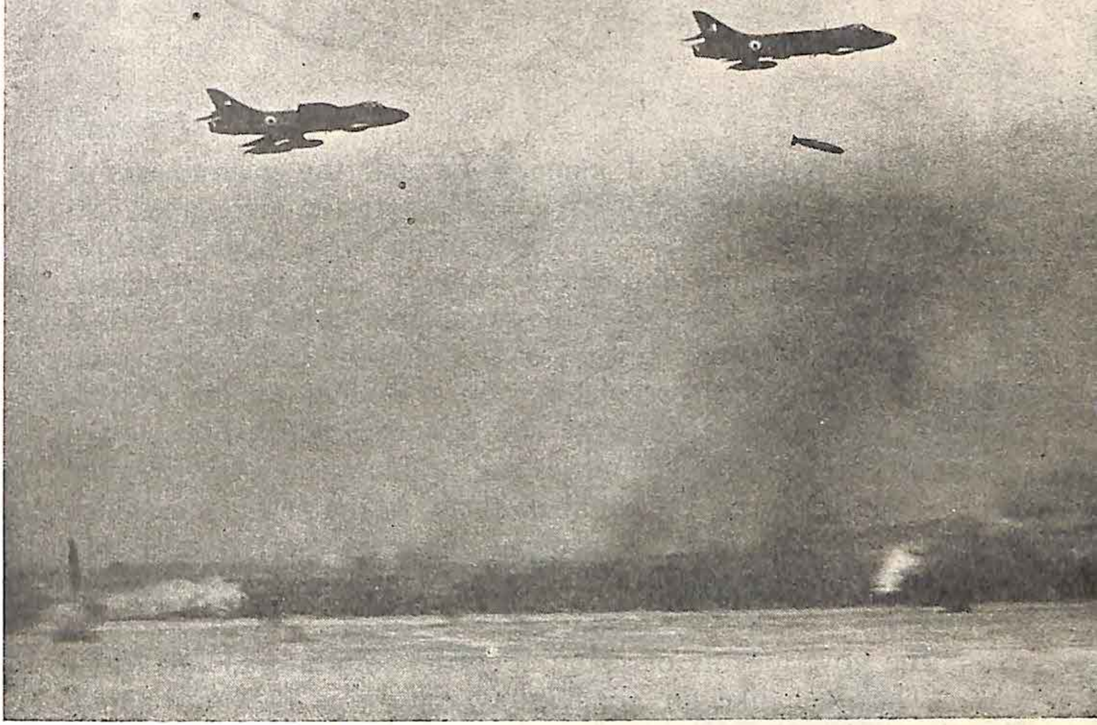


Fig. 9. Bombing from an aeroplane

You will be surprised to know that when for the first time a pilot wanted to use his plane for fighting he placed a machine gun on his plane. The plane could not rise very high as it became too heavy.

As the war went on, the aeroplanes were used more and more. A number of factories were set up to make aeroplanes. A number of airfields were also built. Gradually, planes began to be used for dropping bombs and shooting enemy troops, vehicles and tanks. Planes would also go and find out the location of enemy troops or important places like petrol dumps, factories, electric power stations, railway stations, aerodromes, bridges, stores of rations, equipment, etc. Thousands of young men were taught how to fly the planes so as to do these jobs. But, before many planes could be made the war came to an end. However, the importance of planes for fighing a war had been understood.

When World War I came to an end, the governments of many countries did not know what to do with the aeroplanes. No one wanted these planes; so no new planes were made. Several people began to think of different ways of using the aeroplanes. Some Europeans thought that the aeroplanes could also be used when there was no war. Instead of travelling by trains they could travel quickly by the aeroplanes. So travelling by air started. Germany and Holland were the two countries which first started regular air travel. Many countries like Britain and France followed them. Only a few people could be taken in the aeroplanes which were made in those days. Travelling by air was very costly. The governments of some countries started using aeroplanes for carrying the mail.

The governments of many countries jointly made air traffic rules. These are like the road safety rules you all know about. The air traffic rules were made to avoid difficulties and accidents. These governments decided to test the aeroplanes before permitting them to fly. This was done to make air travel safe. The pilots were guided by the people on the ground. This control reduced the chances of accidents, specially in bad weather. This was done by a new method called the "two way radio" by which the pilot and the officer controlling the plane from the ground could talk to each other. Aeroplanes became larger in size and faster in speed. Flights became more and more efficient, comfortable and popular.

As you already know that by the end of World War I, the importance of aeroplanes had been understood by the various countries. Then came World War II. The Air Forces of different countries played an important role in World War II. This war showed that if the Air Force of a country wins over the Air Force of the enemy then the Army and Navy of the winning countries are greatly helped in their fighting. For example, during World War II, American and British Air Forces joined together and

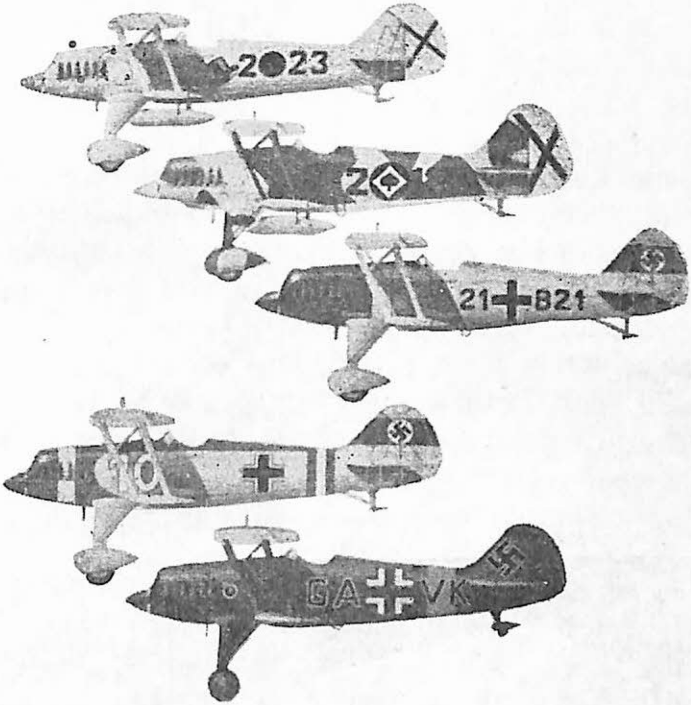


Fig. 10. Some aeroplanes used in World War II

defeated the German Air Force after a great deal of fighting. This greatly helped the American and British armies. Another example was the war between the Japanese Navy and American Navy. The American Navy won the war because of its better Air Force even when their Navy was not as good as the Japanese Navy.

Since the Air Force was found to be so important, many improvements were made in the design of the aeroplanes. Bigger and faster aeroplanes were made. The most important of these improvements was the jet engine aeroplanes.

Another new weapon called the missile was made by Germany during this war. I will tell you about these a little later.

Around this time, helicopters were also made. You will learn more about these in later chapters. In America, Russia and

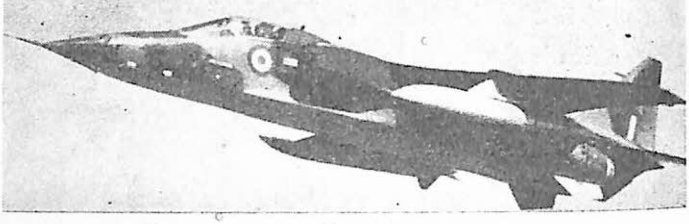


Fig. 11 (a). Jaguar

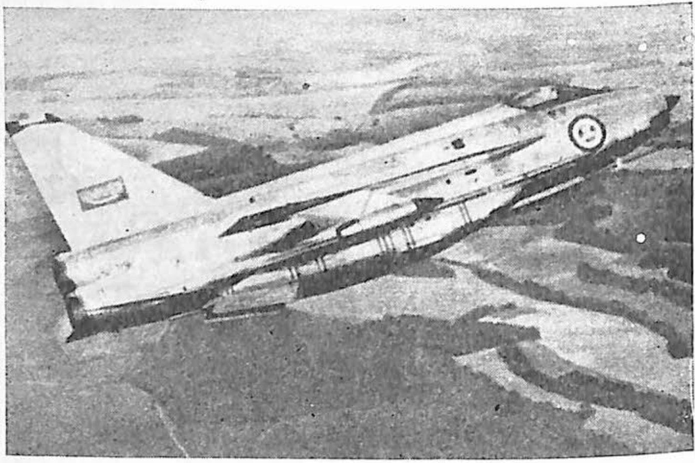


Fig. 11 (b). Lightning

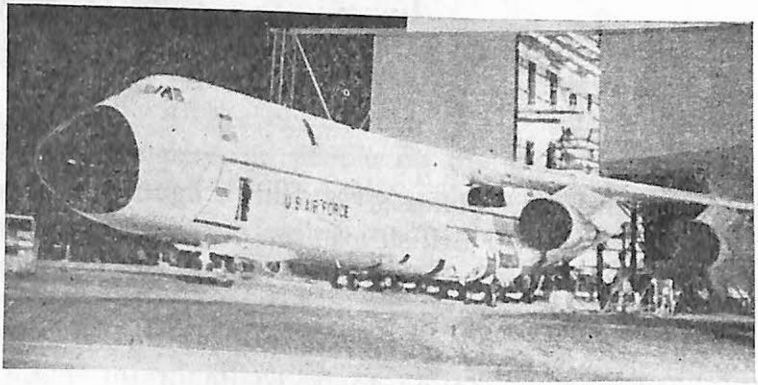


Fig. 11 (c). C 5A Glaxy

Some Modern Aeroplanes

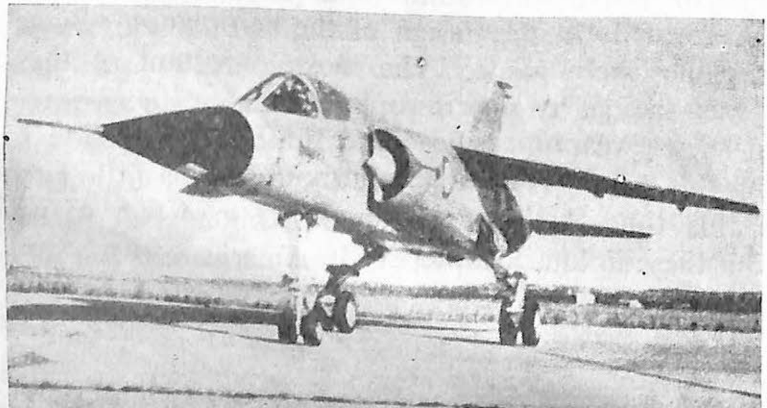


Fig. 11 (d). Mirage

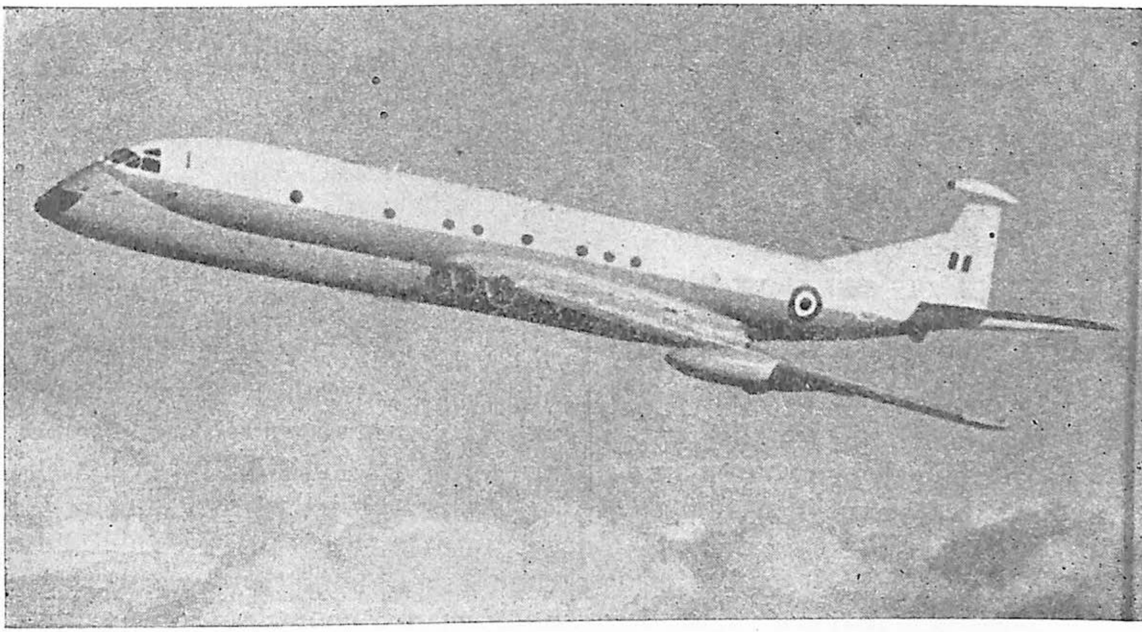


Fig. 11 (e). Nimrod

several other countries scientific research is going on and many new types of aeroplanes are being made. These new types of aeroplanes are bigger in size and faster in speed. We will talk about these when I tell you how aeroplanes fly.

I have just told you the story of how man began to fly and how gradually he began to take interest in flying. I have also talked to you about his efforts to improve his methods of flying. With all the hard work of so many people, today we have all types of fast moving, big and beautiful aeroplanes.

4 | Aeroplanes for Civilians

You all know that many years ago, after World War I, aeroplanes were used for taking people from one place to another. When the importance and uses of aeroplanes were understood more aeroplanes were made. Travelling by road, rail or sea took much longer. During World War II, as you already know, many countries had aeroplanes and several Air Forces were formed. The improvements were not only made in the planes for war, but better planes were also made for air travel. These planes could take more people and were made more comfortable to travel in.

Airlines were formed in many countries for carrying passengers by aeroplanes. Germany and Holland were the countries which first set up their airlines. Many countries followed. Today, most of the countries have their own airlines. In India we have the Indian Airlines for travelling within the country and Air India for flying to foreign countries. In the same way America, Japan, Britain, Pakistan, Russia and many other countries have their own airlines.

You must have seen beautiful pictures of people travelling by air. In the airline planes, there are comfortable seats, blankets and pillows, cold or hot drinks, snacks and meals for the passengers during the flight. There are magazines and newspapers for the passengers to read. There is a toilet and also a place to keep the luggage.

There are usually five or six people working in a plane, to fly it and to make the journey comfortable for the passengers. All these people are collectively known as air crew. The number of

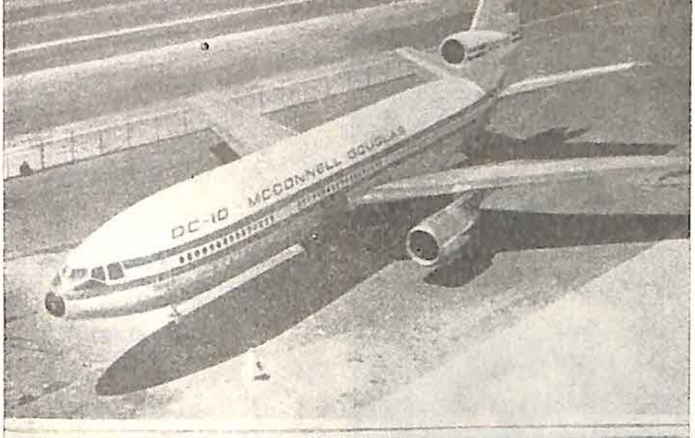


Fig. 12 (a). Douglas DC 10

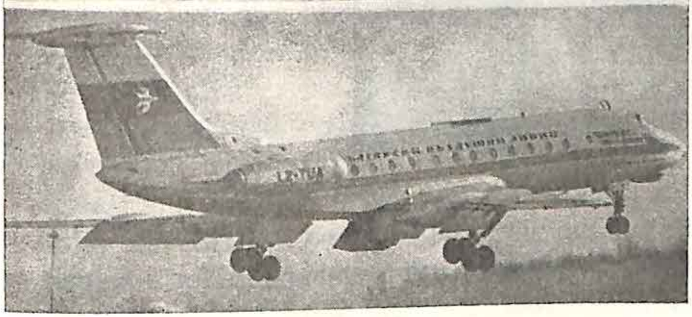
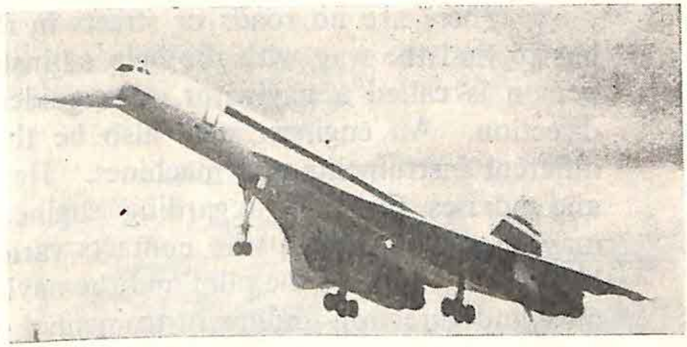


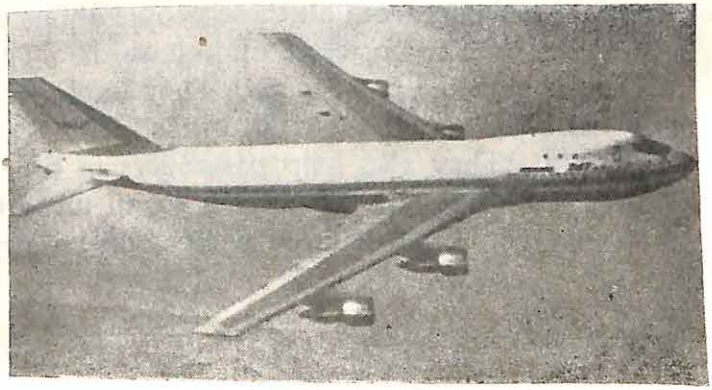
Fig. 12 (b). TU 134

Fig. 12 (c). Concorde



Some Modern Aeroplanes used by Airlines

Fig. 12 (d). Boeing 747



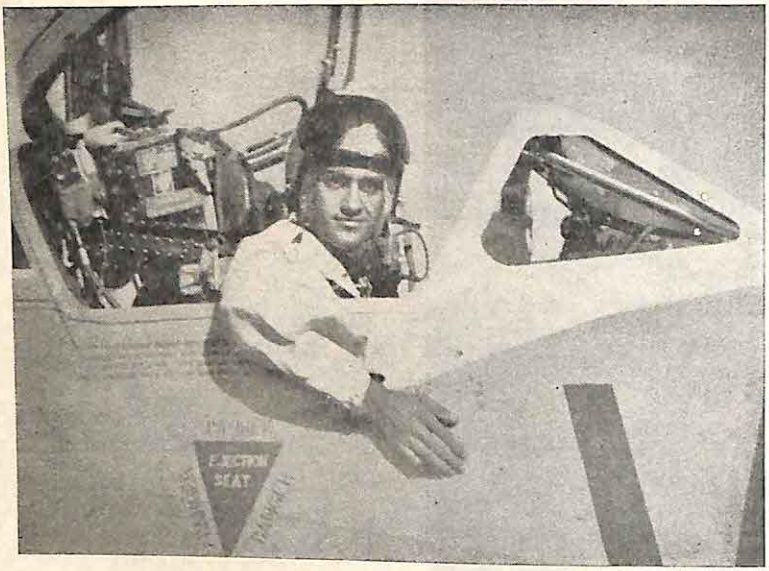


Fig. 13. A pilot in a training aeroplane

people working depends on the size of the plane. There is a pilot who flies the plane and is the Captain of the team. He is helped by a person called the co-pilot for flying the plane.

There are no roads or streets in the air. Hence, a person has to find the way with the help of instruments and maps. This person is called a navigator. He guides the pilot in the correct direction. An engineer may also be there to keep checking the different instruments and machines. He also repairs small defects and advises the pilot regarding engine and instruments. There may be a radio-officer who contacts various people on the ground by radio. He helps the pilot and the navigator in the use of landing aids and direction-finding instruments. He also looks after the radio and radar equipment about which you will learn later.

Apart from all these people about whom you have just read, there are air hostesses and stewards. These are women and men who help the passengers. They look after the passengers and give them tea, coffee or cold drinks. If it is meal time, they give them food. They also help passengers in times of emergency.

You must have been to an airport some time. If you have not, then I will tell you what is on an airport.

There are usually one or two *runways*. Runways are special roads on which the planes run before take off and after landing.

The *terminal building* is the place where you go to leave or receive people. It has a waiting room, restaurants, booking offices, custom offices, baggage counters, shops, dressing rooms and sometimes rooms for people to stay for a short period.

There is a high building called the *control tower*, from where the entire airport can be seen. This is the place from where ground controllers supervise the landing and take off of aeroplanes. They pass instructions to the aeroplanes over the radio. This building relays the weather forecasts for the places where the planes are going and for the route. This building also has the office which gives information to the pilot and explains the route he must follow. There are *hangars* where the aeroplanes are parked and repairs done to them. The small roads from the parking places to the runway ends are called *taxi-tracks*.

Several other things like gangways, luggage carriers, jeeps, fueling stations, etc. are also present on airports.

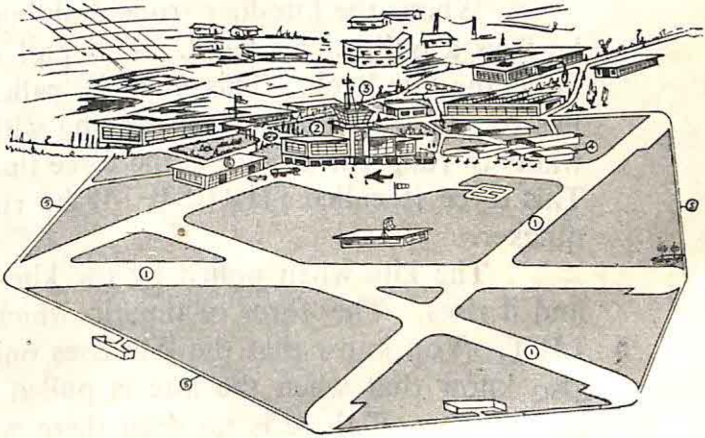


Fig. 14. Sketch map of an airport

1. Runways
2. Offices of weather forecast, ground controllers, etc.
3. Control tower
4. Hangars
5. Taxi-tracks
6. Terminal building

5 | How does an Aeroplane Fly?

I HAVE BEEN talking about aeroplanes and the improvements which have been made in the newer types of aeroplanes. You must be wanting to know how an aeroplane flies and more about the various types of planes. Lastly, many of you, especially those who have never seen a plane from inside, would like to know the various parts of the plane and their uses.

You must have all flown kites or seen them being flown by other boys. If you look carefully at a kite being flown, you will see that the kite is first put on the ground and a string is attached to it. The kite-flier runs holding the string. As the kite-flier runs, the kite is pulled against the wind. When this happens, the kite rises off the ground. By running faster the force of the air against the kite increases and the kite rises above the ground and starts flying.

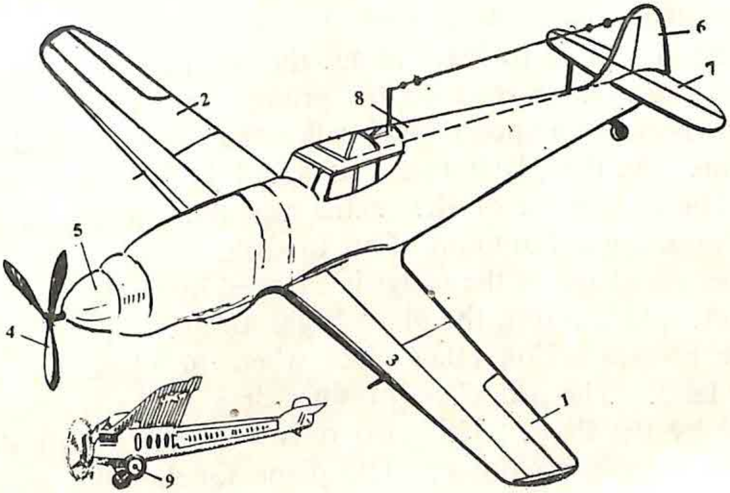
When the kite-flier runs, holding the string tied to the kite, he feels a pull on his hand. This pull is caused by the air, which drags the kite back. This pull is called DRAG. The kite-flier has to run with force while running with the kite. The faster he wants to run, the greater is the force that he will have to put in. This force is called THRUST. If he runs faster, the kite will fly quicker.

The kite when pulled by the kite-flier is lifted up by the air and it rises. The force of the air which lifts the kite is called LIFT. You know that the kite rises only when it is pulled. You also know that when the kite is pulled it creates drag. Thus we can see that, if there is no drag there will be no lift.

The weight of the kite pushes the kite downwards. The drag, the lift, the thrust and the weight combined together make the kite rise. The kite goes up if the lift is more than the weight and comes down if the weight is more than the lift.

A running kite-flier provides thrust to the kite as he is running. In the case of an aeroplane this thrust or force is provided by the engine and the propellers (the fans in front of the plane). When the aeroplane moves, the air hits the wings. This creates the drag and also the lift which is similar to that of a kite. As in the case of a kite, the weight of an aeroplane also tries to bring the plane down. As explained earlier, when all these four forces—the weight, the drag, the lift and the thrust—are combined in a proper manner, the plane flies.

Fig. 15. An aeroplane and its parts: (1) Aileron, (2) Flap, (3) Wing, (4) Propeller, (5) Engine, (6) Rudder, (7) Elevator, (8) Fuselage and (9) Under carriage



You already know that when lift is more than the weight, the plane would go up. Thus the plane can be made to climb up or go down by increasing or decreasing the lift. This is done by the elevators, which are attached to the tail (See Fig. 15). By tilting them up or down, the tail comes down or goes up, thus increasing or decreasing the lift.

In the same way, if thrust is increased, the plane will go forward faster. Thus, the speed of the aeroplane can be increased or decreased by increasing or decreasing the power of the engine, which will increase or decrease the thrust.

The plane should be able to turn right or left. This is done by the rudder which is also attached to the tail (See Fig. 15). This rudder is similar to the rudder used in boats and ships. When the rudder is turned left, the plane starts going to the left. By turning the rudder to the right, the plane turns right. While turning, the plane must tilt in the direction it is turning. This is called banking and is done with the help of ailerons. The ailerons are attached near the end of the wings (See Fig. 15). By working the ailerons and the rudder at the same time and in a proper manner, the plane is made to turn smoothly.

The last thing to learn about the aeroplane is how it starts flying. An aeroplane rests on the ground on its wheels. It runs on these wheels on a special road called the runway, which is at the aerodrome. As the plane runs, its speed is increased more and more. The movement of the plane and the running of the propellers cause a great amount of air to strike at the wings. At the same time, the shape of the wings is changed by the flaps to produce greater lift. As a result, the plane begins to fly. This is called take off. The reverse action takes place when the plane has to come down to land. The propellers produce drag at the wings, which is increased by the flaps. This also resists the motion of the plane and helps it to come down. The plane touches the ground and runs on the runway. The speed of the aeroplane is slowly reduced by applying brakes on the wheels. This is called landing.

In earlier chapters, I have mentioned some types of aircrafts. I will now tell you about them.

A large number of planes you see today are jet engine aeroplanes or Jets. These do not have propellers in front. Air is compressed in these jet engines. In this compressed air, a special type of fuel is burnt by an electric spark. The hot air under pressure comes out through an opening as a jet. You will learn more about this when you become a little older. Jets make a whistling sound and travel much faster.

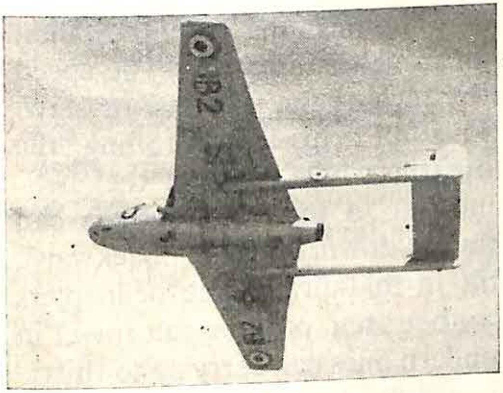


Fig. 16. A jet aeroplane—Vampire

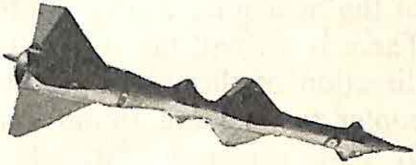


Fig. 17. A missile

Missiles were made during World War II. Missiles are not flown by pilots. Missiles go up with the help of the jets. These jets are similar to the jets used in jet aeroplanes but are not exactly the same. Missiles are controlled while flying with radio, radar and other electronic equipment from the ground. By controlling I mean, turning, going up or down, going fast, etc.

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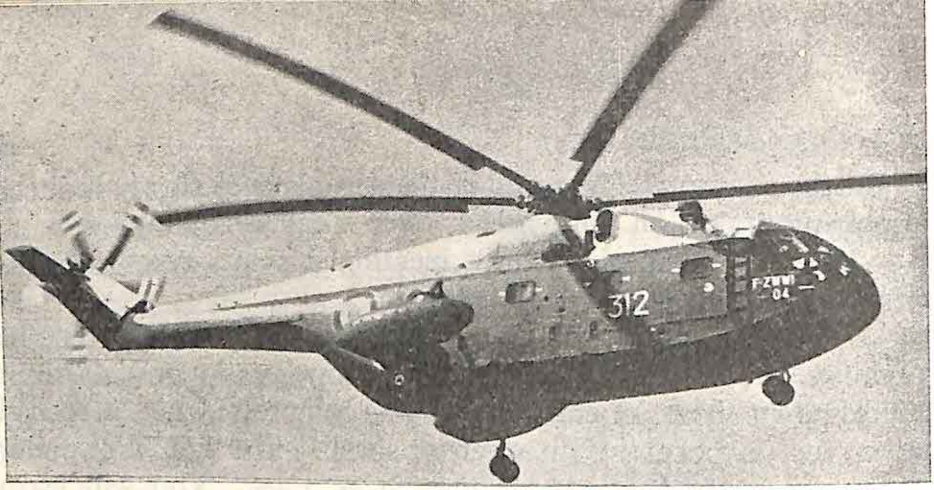


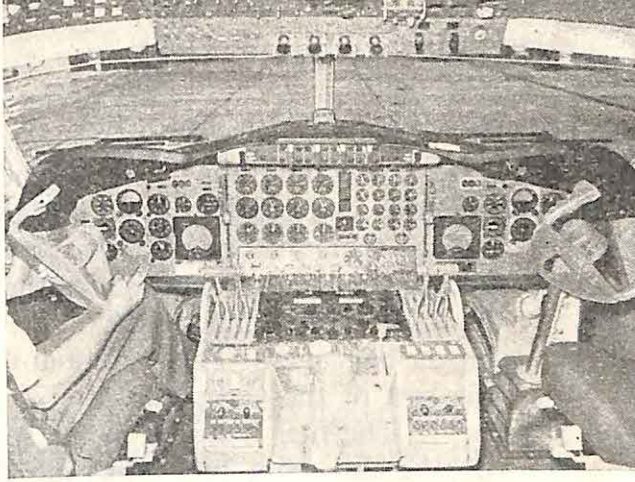
Fig. 18. A helicopter

In 1940, about thirty years ago, a new type of flying machine called helicopter was made. A helicopter has a big fan on the top called the rotor. When this fan rotates, the helicopter flies. Many helicopters have jet engines to drive these rotors. The speed of the helicopter can be controlled by turning the fans fast or slow. There is a small fan on the tail. This fan helps in controlling the direction of the helicopter and stops the whole body of the helicopter from going round and round like a top. Helicopters can fly in any direction — straight up, straight down, forward, backward, sideways. They can even stand still in mid-air. Some helicopters have two big fans on top. Usually about ten persons can travel in a helicopter, though some of the modern ones can carry up to thirty-five to forty persons. Since the helicopters can rise up from a small place, they are used to save people, who are trapped in mountains, injured on the battle-fields or caught in floods. These are also used to transport passengers from cities to airports, to avoid traffic delays. Helicopters also carry mail.

Let us now have a look inside the plane and see what it looks like.

Right in front at the nose is the cockpit. In the cockpit, there are the various dials, gauges, buttons, etc., which control the engine. There are seats for the pilot, co-pilot, navigator, engineer

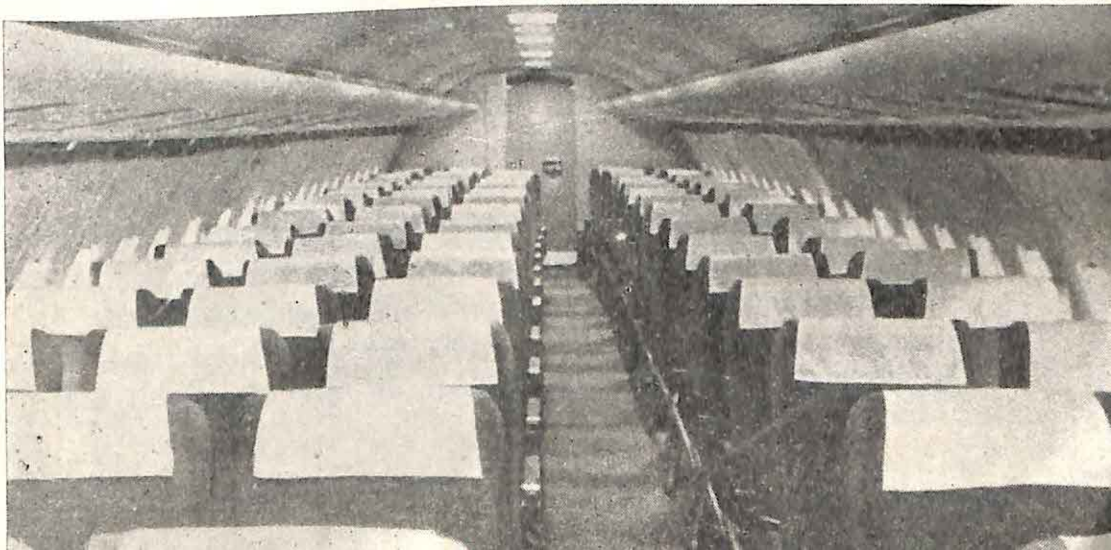
Fig. 19 (a). Inside of an aeroplane—cockpit



and radio-officer. These officers have their various instruments. All these officers do not fly in every plane. The number of officers going in the flight varies with the distance and the size of the plane. One section of the cockpit may have a small place where the crew may rest. There is also a compartment from where the crew, air hostesses and the stewardesses make the announcements, serve the drinks and meals etc. The passengers are not allowed to enter these sections of the aeroplane.

There are several seats for the passengers. The number of seats differ with the size of the plane. There are places to put

Fig. 19 (b). Inside of an aeroplane—fuselage



newspapers and magazines. There is place above the seats for blankets and small bags of the passengers. There are toilets. In the tail there may be place for some small baggage of the passengers. The part of the aeroplane from the cockpit to the tail is known as the fuselage. The under side of the fuselage is used for keeping the bigger baggages. There are many wires running from the cockpit to the rest of the aeroplane.

The fuel is stored in the wings. In war planes, the missiles, bombs and extra fuel tanks are attached to the wings.

As more modern planes are made, you will see certain new parts and differences in them. I am sure you will find it most interesting to see and learn about the modern planes which are being made in the world today.

6 | Flying in India

I AM SURE you are all eager to know when and how flying started in India. Flying in India is about fifty years old. Gradually, the people in our country began to take interest in flying and the first flying club was set up at Karachi, then in India and the next at Calcutta, about forty years ago. These clubs created much interest in flying. The number of people going to these clubs increased. Many more flying clubs were set up in India; some of them were at Bombay, Delhi and Madras.

About thirty-five years ago regular air travel began in India. At first, there were some private companies which had their own planes. These companies flew the planes and were responsible for the air travel. A few years after independence, in 1953, the Government nationalised these companies. This means that the Government took over all these companies and made one big company called the Indian Airlines Corporation or IA for short. About the same time the company for travel to other countries was recognised and was called Air India International or just Air India. You must have seen the pictures of the Maharaja advertising travelling by Air India.

Aeroplanes of Air India fly to foreign countries. Air India always gets the fastest and biggest modern planes. At present Boeing 707 and Boeing 747 planes are being used.

Indian Airlines Corporation also tries to get better aeroplanes. At present, Indian Airlines Corporation uses Caravelle, Viscount, Fokker Friendship, HS-748 and Dakota aeroplanes. Dakotas are

Some Aeroplanes used by Air India

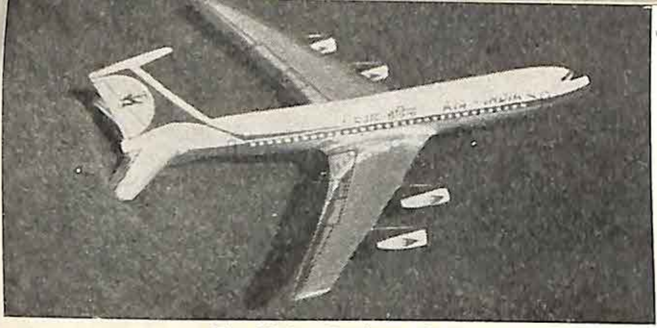
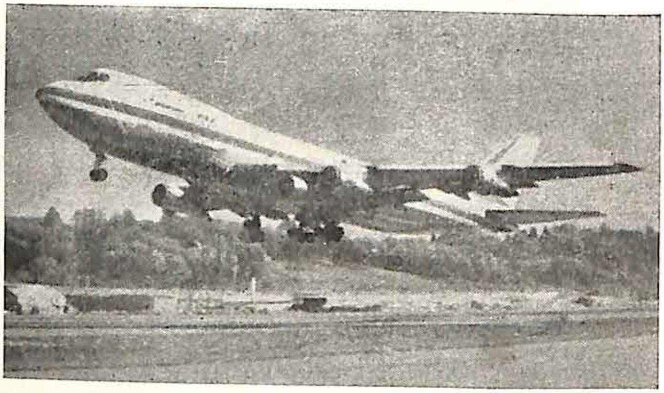


Fig. 20 (a). Boeing 707

Fig. 20 (b). Boeing 747



Some Aeroplanes used by the Indian Airlines

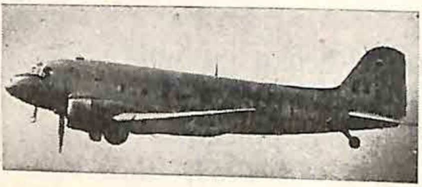


Fig. 21 (a). Dakota

Fig. 21 (b). Fokker Friendship

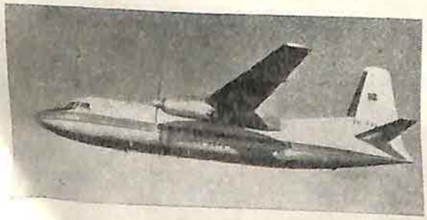
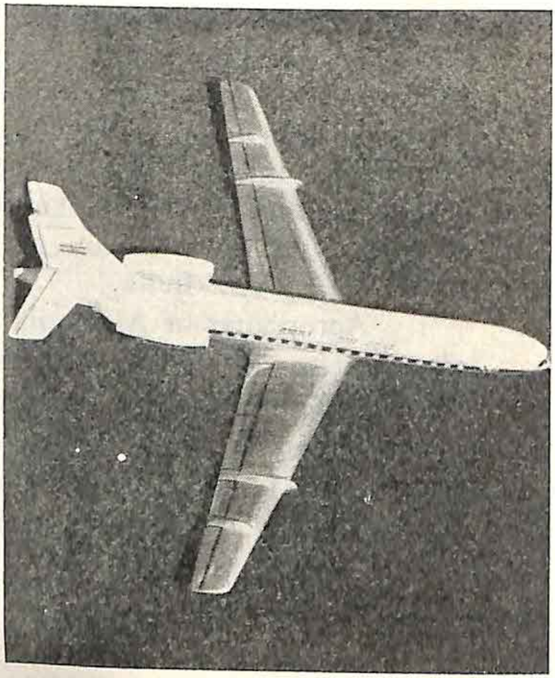


Fig. 21 (c). Caravelle



not being used very much these days and are being replaced by a faster aeroplane called, the HS-748. HS-748 is made in India, at Kanpur.

You already know about an airport and the air crew of an aeroplane. In addition, there is a person who is responsible for looking after all Civil Aviation in India. He is called the Director-General of Civil Aviation. He looks after all the airports in India. He has many officers under him. These officers work in different offices throughout the country. His men check up the aeroplanes and other equipments. An aeroplane can take off only when his men have found the aeroplane safe and fit for flying after these tests.

Some of you must have travelled in the aeroplanes of the Indian Airlines Corporation or seen these at airfields or in photographs.

A large amount of flying done in India is by the Indian Air Force. Around the time when regular air travel started in India, a committee was appointed by the British Government, which ruled over India at that time. Shri Jawaharlal Nehru's father Shri Moti Lal Nehru was a member of this committee. One of the suggestions made by this committee was that an Air Force should be set up in India. About four years after these suggestions were made, Indians were sent to England for training in the Royal Air Force College. These Indians became the first few Air Force pilots. In the meantime the training of Air Force soldiers called airmen started in India.

On 1st April, 1933, about fourteen years before we got our independence, the Indian Air Force was formed. You will be surprised to know that when the Air Force first began, there were only six officers and nine airmen. The Royal Air Force, which is the British Air Force, was very helpful. Within six years, the number of officers had increased from six to sixteen, and that of the airmen to two hundred and sixty-nine. Not many people had joined the Air Force, but the training continued. The purpose of this Air Force was to guard the coasts of India against an attack. The planes used were called Wapitis. The planes were kept at Calcutta, Madras, Cochin, Bombay and Karachi.

About six years after the Air Force was formed, the World War II started in September, 1939. Many of our Air Force Officers fought with the Royal Air Force in Burma against the Japanese. Many Indian officers were given awards for bravery after this war.

During and after the war, our Air Force kept on improving and becoming bigger. A number of new aeroplanes were added. The number of officers and airmen also increased. Even then it was very small compared to other Air Forces of the world.

As you all know, we got our independence in 1947. The country was divided into India and Pakistan. The small Air Force that we had was divided into two parts. The Air Force centres in Punjab and Sind went to Pakistan. Similarly, some aeroplanes were given to India. All those officers and airmen who wanted to stay with our Air Force stayed.

Due to partition, those Indians who were staying in the portion which became Pakistan had to come to India. Our Air Force carried a few of these people. It also protected many others against riots during their travel to India.

Soon after partition, there was fighting in Kashmir. The Air Force helped there in several ways. Without the help of the Air Force, the Army would not have reached Srinagar and Leh in time. The Air Force helped by carrying troops, food, ammunitions and weapons. They also attacked from the air and helped the Army to win the war.

After partition, changes began to take place. New bases and training schools were set up. More equipment was bought. New aeroplanes were purchased from France, England, America and Russia. Help was given by the Air Force to the people during

Some Aeroplanes made in India

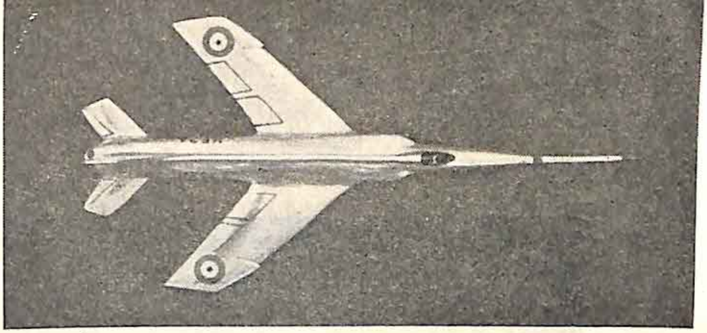


Fig. 22 (a). HF 24

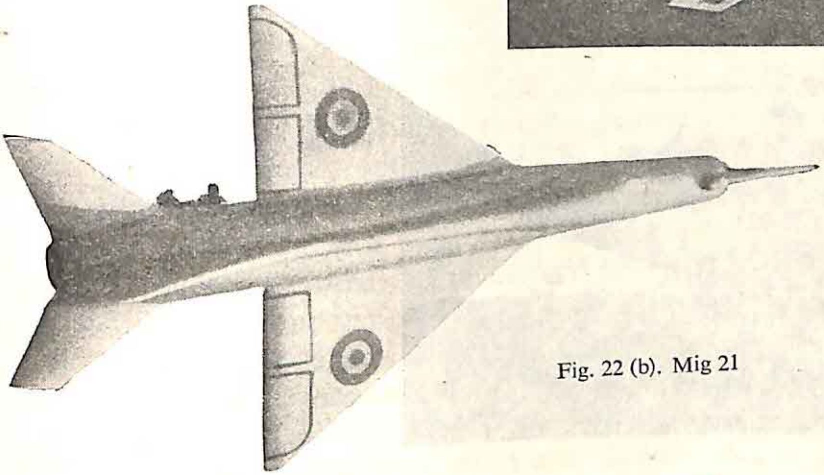


Fig. 22 (b). Mig 21

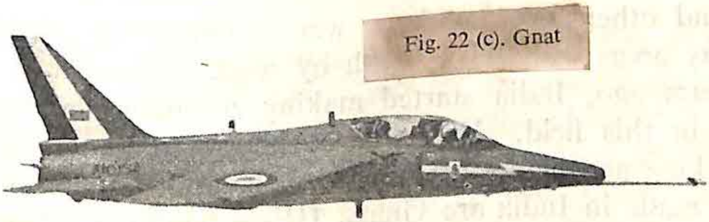


Fig. 22 (c). Gnat

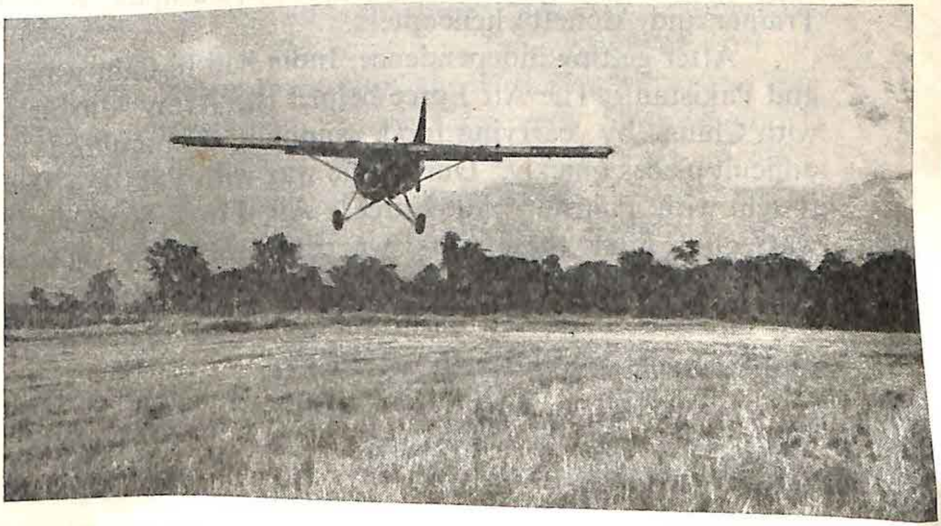


Fig. 22 (d).
A trainer aircraft

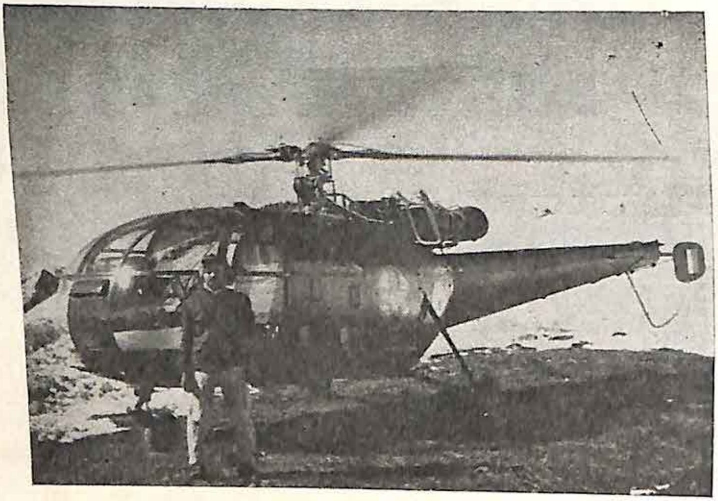


Fig. 23. A helicopter made in India

floods. Food and other articles of use were dropped for people living in far away areas difficult to reach by road.

A few years ago, India started making aeroplanes and is now improving in this field. You will be happy to know that India is now making aeroplanes at Bangalore, Kanpur and Nasik. Aeroplanes now made in India are Gnats, HF-24 fighter bombers, Mig-21 fighters, HS-748 transport planes, Pushpak, Krishak, HJT-16 Trainer and Alouette helicopters.

After getting independence, India had to fight wars with China and Pakistan. The Air Force helped the Army during the fighting with China by carrying food, supplies, ammunitions and men to difficult places quickly. During the war with Pakistan the Air Force fought with Pakistan Air Force. Air Force worked well in these wars, but after these wars, we came to know that more should be done to make the Air Force better. We bought new weapons, new aircrafts, improved the training of officers and airmen. More improvements continue to be made.

7 | The Indian Air Force

YOU HAVE learnt how the Indian Air Force came into being and how it has progressed through the years. I am sure you would like to know how it is organised today.

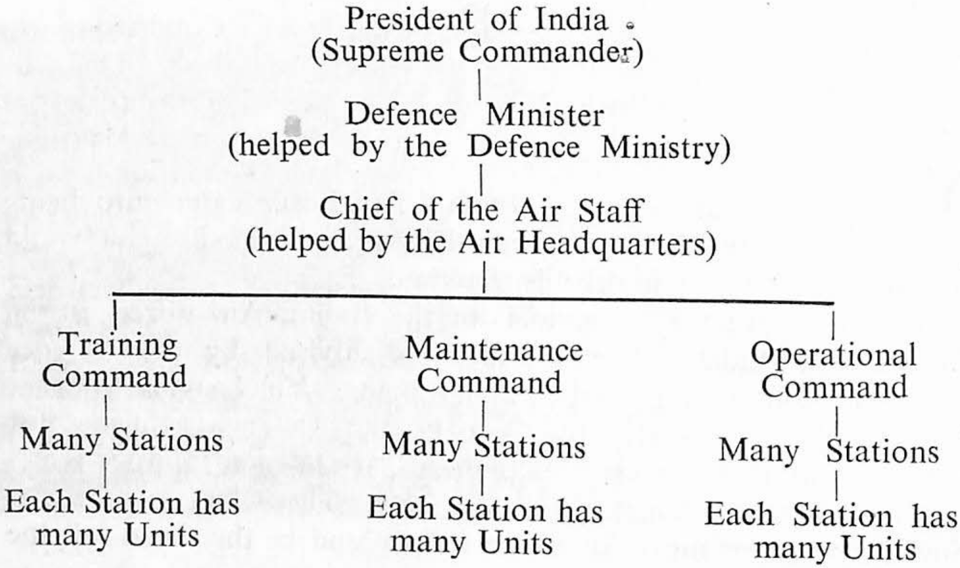
The Supreme Commander of the Indian Air Force is the President of India. The President is advised by the Defence Minister about various policies and plans. The Defence Minister is helped by various civilian officers of the Defence Ministry for working out these policies and plans. The Defence Minister issues instructions to the Chief of the Air Staff. The Chief of the Air Staff is the senior most Air Force Officer and is the head of the Indian Air Force.

We have a number of Air Force Officers working at the Air Headquarters to help the Chief of the Air Staff, as we have the Defence Ministry to help the Defence Minister.

Air Headquarters is the highest Air Force formation of the Indian Air Force and is located at New Delhi. It is through the Air Headquarters that the actual work is done.

The Air Force is divided into three types of Commands. Each Command is responsible for doing a particular type of work of the Air Force. The Commands plan the work and supervise the Stations and Units under them. There are many Stations under each Command. The Stations look after housing, pay, health, medical care, transport, storing of equipment, etc. Each Station has many Units under it. There are officers in charge of each Command, Station and Unit. Under these officers several other officers and airmen work.

Let us understand this with the help of a diagram.



The Headquarters of the Training Command are at Bangalore. The various Stations under this command are located in different towns. These Stations carry out various types of training. This training includes the training of officers to become pilots, navigators, engineers, accountants, administrators, education instructors, etc. The airmen's training includes the training of mechanics of various kinds, clerks, store-keepers, etc.

The Headquarters of the Maintenance Command are at Nagpur. The Stations under this Command are responsible for storing and supplying planes, ammunitions, guns, clothing and other equipment and articles used by the entire Air Force. This Command also controls Stations which carry out big repairs or overhauling work of various kinds of equipment, guns, planes, etc.

There are three Operational Commands—Western, Eastern, and Central. The actual work of defending the country is done by these Commands. These Operational Commands are responsible for defence of the area under their control. This work is then given to the various Stations under each Command. There are a number of Units on each Station. The Units in which planes are flown are usually called Squadrons. Each Squadron has one type of aeroplanes under it. There are pilots to fly these planes, engineers, other officers and airmen are there to help them. These Squadrons move from place to place especially in the time of war as the need may be. Under these Commands there are some Stations having Units which keep missiles. These missiles are also used for defence.

Some work of the Air Force is directly planned and ordered by the Air Headquarters. I will tell you about this a little later. As you will learn later, to defend the country the Indian Air Force has to work in co-operation with the Army and Navy. There are agencies where the officers of all—the Army, the Navy and the Air Force—work and plan together.

8 | How to Join the Indian Air Force ?

I WONDER how many of you know that only Indian citizens can join the Indian Air Force. When an Indian citizen wants to work in the Air Force, he sends in an application. Before he can start working, he has to be tested by one of the many selection boards. He is also examined medically. After he is found fit in both these tests, he is trained in one of the training units. We have talked about the various training units already.

There are mainly two types of people working in the Air Force — Officers and Airmen. Airmen are like the Jawans in the Army, and the Sailors in the Navy. The airmen are divided into five groups according to the type of work they do. With effort and hard work, they can slowly improve their group. There is a special system by which, after some time, they can take an examination and become officers, if they are successful.

The selection of airmen is called recruitment. This is done at the various recruiting offices. For becoming an airman of the first four groups, boys have to be matriculates. Airmen of these trades do technical, semi-technical and non-technical work.

After selection they are all trained at one of the various units at Bangalore, Madras and Belgaum (a place in Maharashtra State). After training they are sent to various units for work.

Officers in the Air Force are divided into various branches. One branch is the Flying Branch. The officers of this branch fly. They may be either pilots or navigators. The officers of the other branches work mainly on the ground. The aeronautical engineering, the administrative, the accounts, the meteorological, the education, the logistic and the medical branches are grouped together to be called the Ground Duties Branch.

Young men who are matriculate and want to beocme pilots apply to Union Public Service Commission. This is a Government body for selecting people for various jobs for the Indian Government. Those young men who pass the tests carried out by the Union Public Service Commission are further interviewed and tested by one of the Air Force Selection Boards. After passing the selection examination they are medically examined, and if found fit, are sent to the National Defence Academy (NDA) near Poona. At the National Defence Academy they are trained for three years.

After this training, they are sent for flying training to various schools. After finishing the flying training, they go to various Units to work. In addition to this, those who have passed the NCC examination, go directly to the flying training schools after selection.

The ground duties officers are those who have studied in colleges and have passed examinations in engineering, medicine, teachers training or accountancy, etc. They are selected by a Selection Board, are medically examined and are trained in one of the Air Force training colleges. After the training, they are sent to different Units for work.

Now, you know that all the officers and the airmen have to be selected and trained before they start working in the Air Force Units or Stations.

9 | Officers of the Indian Air Force

YOU ALL know that as you grow older and learn more you go from one class to the next higher one. In the same way, the officers and the airmen rise from one rank to the higher one.

The lowest rank for an officer is Pilot Officer (Plt. Offr.). The next higher ranks are Flying Officer (Fg. Offr.), Flight Lieutenant (Flt. Lt.), Squadron Leader (Sqn. Ldr.), Wing Commander (Wg. Cdr.), Group Captain (Gp. Capt.), Air Commodore (Air Cdre.), Air Vice-Marshal (AVM), Air Marshal (AM), and Air Chief Marshal. Later in this Chapter you will learn a lot more about these.

The lowest rank of an airman is Aircraftsman 2 (AC2). The next higher ranks are Aircraftsman 1 (AC1), Leading Aircraftsman (LAC), Corporal (Cpl), Sergeant (Sgt.), Flight Sergeant (Flt. Sgt.), Warrant Officer (WO) and Master Warrant Officer (MWO).

You will be surprised to know that by looking at an Officer or an Airman in uniform, one can tell his rank and the branch to which he belongs. The diagrams given on the next page will tell you something more about this.

You will often find officers wearing small coloured ribbons or ribbons with medals on their uniform. Sometimes officers are given awards. These are worn with coloured ribbons around the neck. The medals and awards are given for taking part in various wars, for acts of bravery or for doing good work.

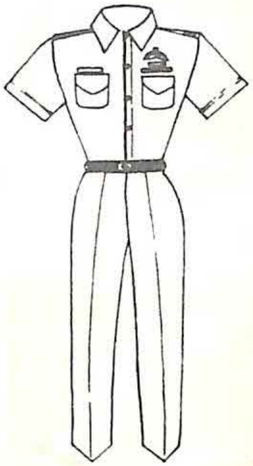


Fig. 24. Officers' uniform

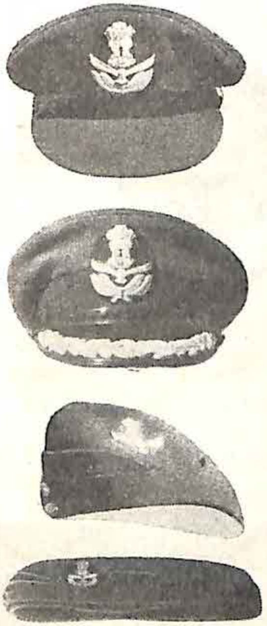


Fig. 25. Caps of officers
Officers' peak cap up to the rank of Squadron Leader; peak cap of a Group Captain (For Air Commodore and above, there are two rows of laurels on the peak); side cap of officers up to the rank of Squadron Leader; side cap of officers above the rank of Squadron Leader

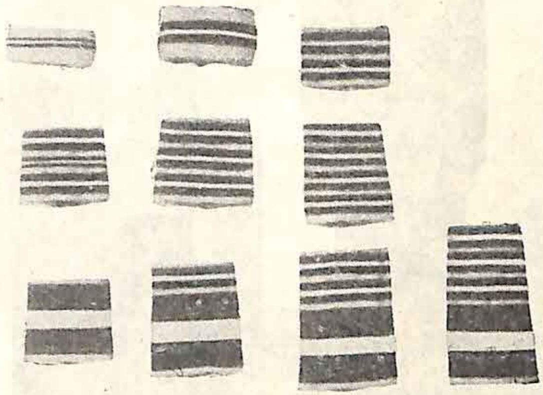


Fig. 26 (a). Rank badges of officers
1st row (left to right): Pilot Officer, Flying Officer, Flight Lieutenant
2nd row (left to right): Squadron Leader, Wing Commander, Group Captain
3rd row (left to right): Air Commodore, Air Vice-Marshal, Air Marshal, Air Chief Marshal

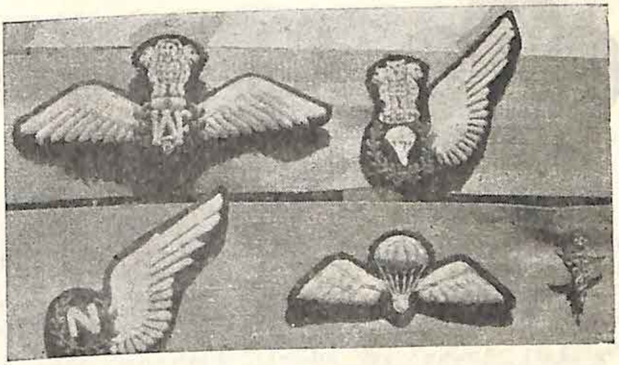


Fig. 26 (b). Badges worn by officers
1st row (left to right): Pilot, Para Jumping Instructor (These are worn above the pockets and ribbons of the uniform)
2nd row (left to right): Navigator (The letter 'N' is replaced by 'E' for Flight Engineer, 'S' for Signaller and 'G' for Gunner)
Paratrooper (These are worn on the right hand sleeve of the uniform)
Doctor (These are worn on the collars of the uniform)

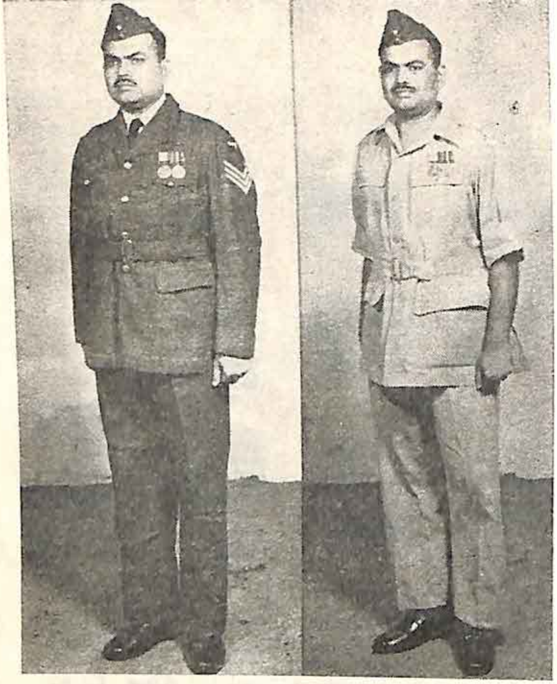


Fig. 27 (a), (b). Airmen's winter and summer uniforms

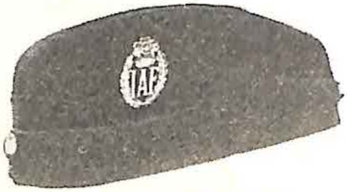


Fig. 28 (a). Cap worn by Flight Sergeant and all airmen below this rank

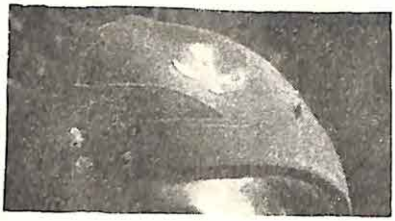
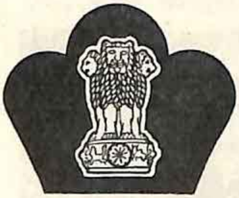
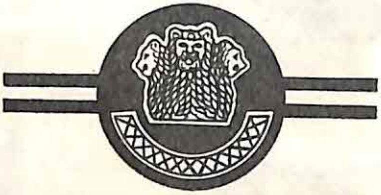


Fig. 28 (b). Cap worn by Warrant Officer and Master Warrant Officer



WARRANT OFFICER

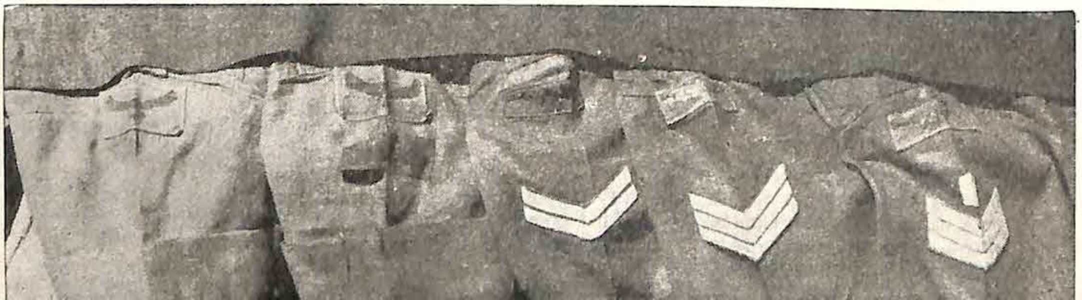
Fig. 29 (a). Warrant Officer's rank badge worn on the sleeve. This does not have an eagle above it



MASTER WO

Fig. 29 (b). Master Warrant Officer's rank badge also worn on the sleeve. This also does not have an eagle above

Fig. 29 (c). Airmen's rank badges are shown on the sleeves of the uniform
Left to right: Aircraftsman 1 and 2, Leading Aircraftsman, Corporal, Sargeant and Flight Sargeant
(All these airmen wear an eagle above their rank badges)



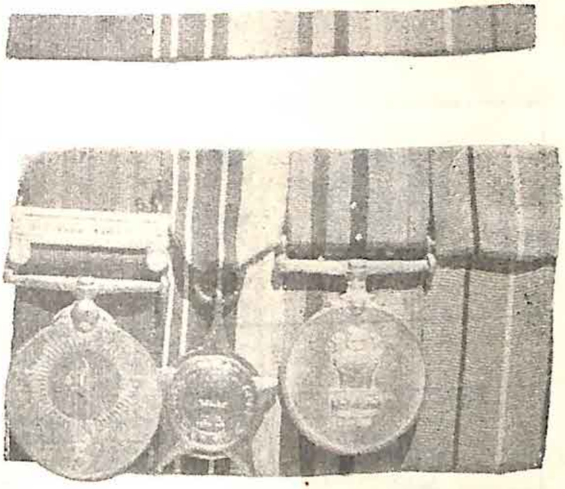


Fig. 30. Ribbons and medals
(These are worn above the top left side pocket)

The Air Force has its own flag. This flag is light blue in colour. It has the national flag in the left hand top corner. Three circles of the colour of the national flag are in the right hand top corner. These circles are called roundals.

All Officers, above the rank of a Squadron Leader, when commanding a Station, Command etc., can fly a flag on their cars.

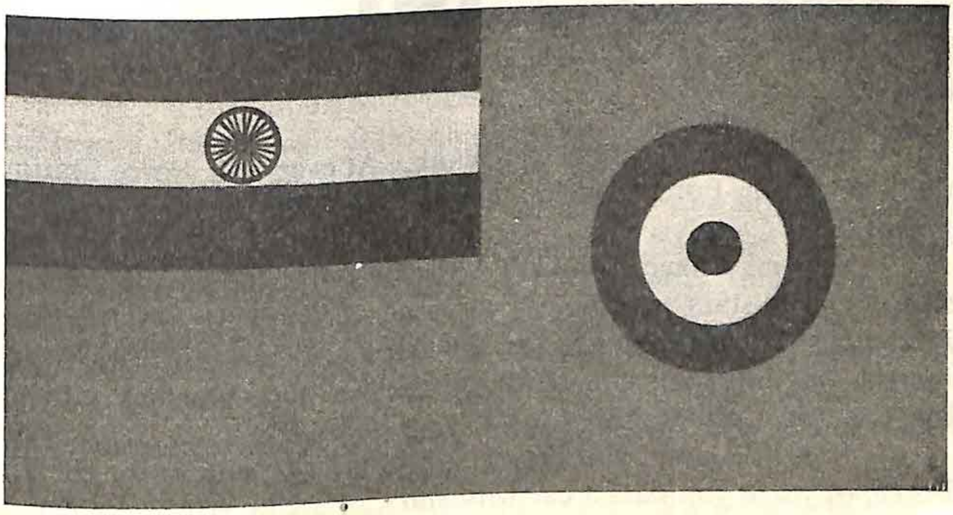


Fig. 31. Indian Air Force Flag

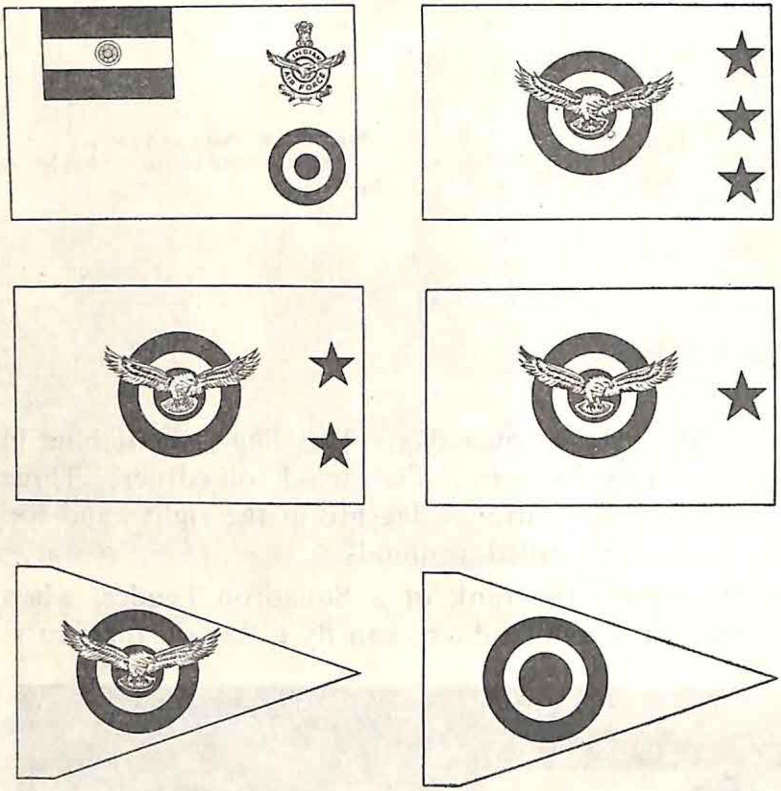


Fig. 32. Flags of officers above the rank of Squadron Leader

1st row (left to right): Chief of Air Staff, Air Marshal

2nd row (left to right): Air Vice-Marshal, Air Commodore

3rd row (left to right): Group Captain, Wing Commander

There are different flags for each rank. At every Air Force Station, the Indian Air Force flag and the flag of Officer Commanding is flown.

You may have seen cars with special plates having stars on them. These stars will also tell you the rank of the person travelling in the car. Four stars are for the Air Chief Marshal, three stars for the Air Marshal, two stars for the Air Vice-Marshal and one for the Air Commodore.

Now whenever you look at an officer or airman of the Air Force, or when you pass a car with stars, or see an Air Force flag or visit an Indian Air Force Station, you will be able to know a lot more than what you did before.

10 | Tasks of the Indian Air Force (I)

YOU MUST BE wondering what all these thousands of officers and airmen do in the Air Force. Before I tell you about their work you must know that every country must protect itself from other unfriendly countries. A country is a home of thousands of people, just as your house is your home. You would not let anyone come into your house and fight you out of it. If he does so you will first tell him not to do so and if he does not listen, you will have to fight and turn him out. To be able to turn him out you must be strong.

In the same way the country has to be looked after. Part of this work of looking after the country is done by the Air Force. To be able to do its work well, the Air Force must be strong.

The most important work of the Air Force is to defend the country against an air attack by an enemy. Most of you know that India is a very big country. It is not possible to protect every little bit of land. The Air Force of no country can protect every bit of its land. Another important thing is that no enemy will want to destroy all your land. They will only destroy important places which might help them. For example, it will not help the enemy if the schools and villages are destroyed. But the destruction of big factories, airfields, the Army or the Air Force Headquarters, railway stations, industries, aerodromes, etc. will greatly help the enemy in winning the war. Hence the Air Force aims at protecting only the important areas and places, known as vital points. The Air Force can protect these places by shooting down the enemy planes when they come to destroy these vital points. Or the Air Force planes

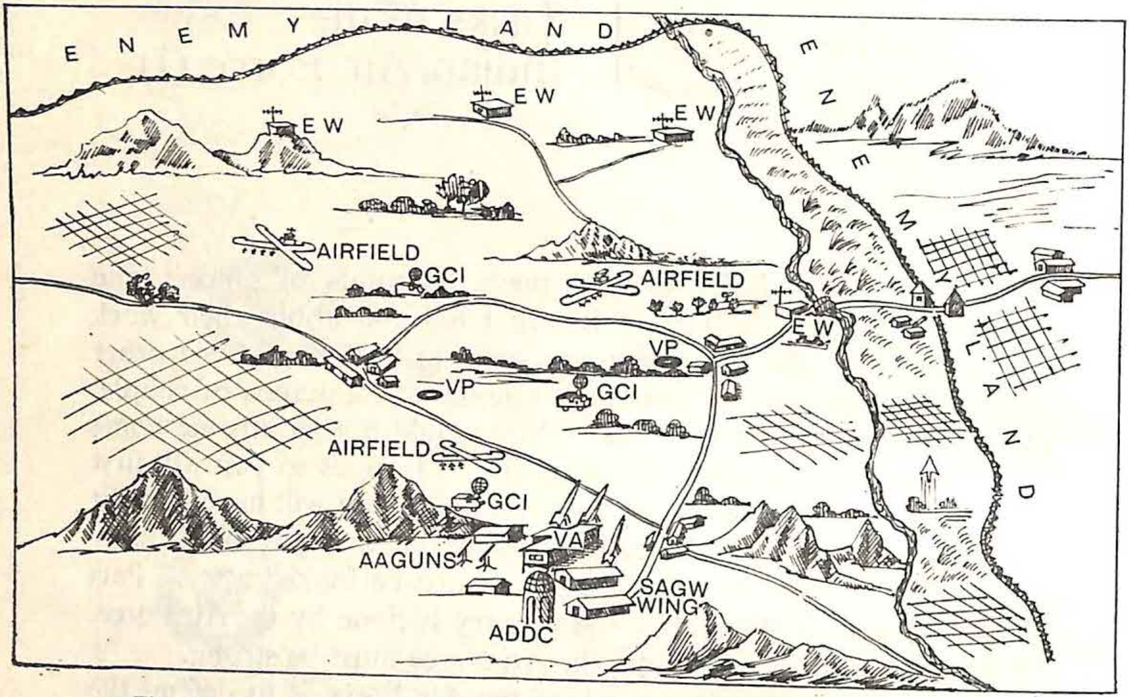


Fig. 33. An area close to the enemy land
EW—Early Warning Stations, GCI—Ground Control Interception Stations
ADDC—Air Defence Direction Centre, VP—Vital Points
SAGW—Surface to Air Guided Weapon Wing or Missile Wing
AA Guns—Anti-aircraft Guns

can fly over the enemy country and destroy all the enemy's planes. Then the enemy would have very few planes left to attack us with.

To be able to do this work, the Air Force must have modern and good aeroplanes and other equipments. It also must have good and efficient officers and airmen. All these must be well organised.

I have already told you that there are three Operational Commands which do the work of defending our country. These Commands have certain areas under them which they have to protect. The land close to an unfriendly country has to be protected well.

If you look carefully at the diagram on page 42 you will see several places marked. First, try to find all the important places or vital points. Yes, the places to be protected are the factories, the railway stations, the bridges, and the Indian Air Force Stations. When the enemy sends planes to attack these important places, our planes must destroy the enemy planes before these can destroy our important places. We can do this only if we know about the coming of the enemy planes as soon as possible. This is important since the enemy planes fly very fast.

We have a special kind of equipment to find out the coming of an aeroplane from a distance. You may not understand about this now but the picture given will show you what it looks like. It is called a radar.

You see a number of small radars in Fig. 33. These are called the Early Warning Stations. These Stations are located as close to the border as possible. These Stations with the help of their small radars can tell when an aeroplane is coming towards our country. They at once inform the bigger office known as the Air Defence Direction Centre or the ADDC for short. There are people at the railway station and the villages near the border, who also inform the ADDC about the coming planes. When the ADDC gets the information about the coming of the planes, it finds out if these planes belong to the enemy country or not. One of the methods for finding it out is with the help of a special type of radar.

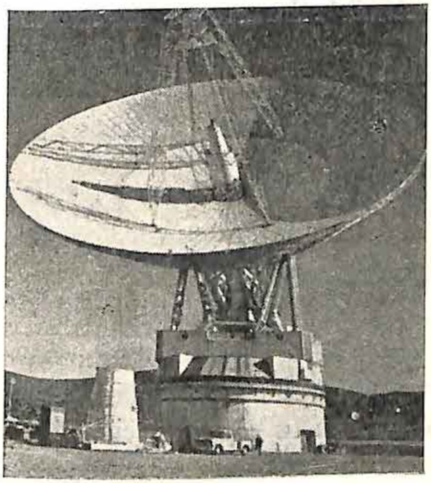


Fig. 34. A radar

There is another set of radars between the Early Warning Stations and the Air Defence Direction Centre. These are important in case one of the early warning radars is destroyed by the enemy.

Some Defensive Aeroplanes

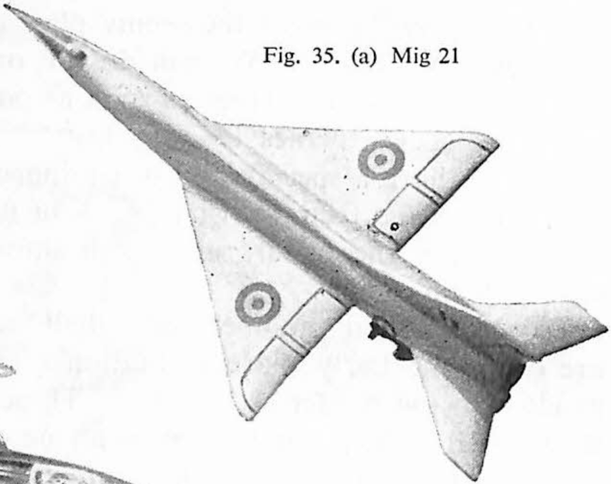


Fig. 35. (a) Mig 21

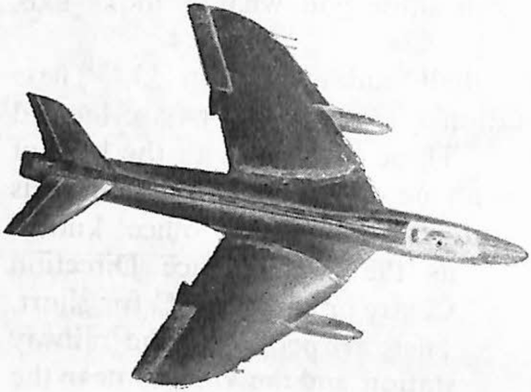


Fig. 35 (c). Hunter

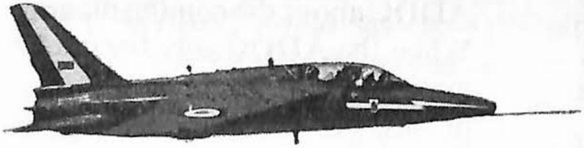


Fig. 35 (b). Gnat

On knowing about the coming of an enemy aeroplane, the Air Defence Direction Centre will give orders to our planes which are sent to shoot down the enemy and defend our country. Mig 21, Gnat and Hunter are the defensive aeroplanes used by India. The pilots in the defensive aeroplanes cannot see the enemy aeroplanes because these are far away. Hence, they need help and guidance to be able to go in the correct direction. This help is given by the staff at the Air Defence Direction Centre. With the help of radar, the staff at Air Defence Direction Centre can know where the attacking and the defending aeroplanes are at any moment. They can then guide the pilots by passing them instructions over the two way radio, about which I have already told you.

Besides the defensive aeroplanes, anti-aircraft guns and missiles may also be used to shoot down the enemy aeroplanes. In such cases the orders are given by Air Defence Direction Centre to Stations having missiles or to Units having anti-aircraft guns.

Anti-aircraft guns are special guns which can shoot down planes only when these fly very low. These guns are placed near important places. The missiles are also installed near the important places. Missiles can shoot down fast flying aeroplanes which may be flying very high.

11 Tasks of the Indian Air Force (II)

WHEN WE are fighting a war we not only protect our important places but also try to destroy important places of the enemy. We must know where these important places are. Air Force planes fly over the enemy country and the pilots see or photograph these places. This is called reconnaissance or recee for short.

After they know the places, aeroplanes are sent which drop bombs and destroy these places. This is called bombing. Bombing of far away places like bridges, shipyards, factories and aerodromes does not help in the battle at once, but the effect comes after some time. For example, if a big railway station is destroyed it becomes difficult for the troops and equipment to come to the battle-fields. In the same way, if factories are destroyed, then it would delay the making of equipment. This would in turn make it difficult for the enemy to fight the war.

This bombing is planned by the Air Headquarters and orders given through the Commands to Units having special bombing planes called bombers.

In war, fighting between the armies goes on near the borders. Near the battle-field the important places are those which might help the Army to win the battle. It is important to know where the enemy's important places are, how many troops the enemy has, what weapons these troops have and the important routes in that area. Most of these facts are found out by the Army itself, but air reconnaissance by the Air Force helps the Army in this respect. The Army may not be able to destroy some of these places. Then

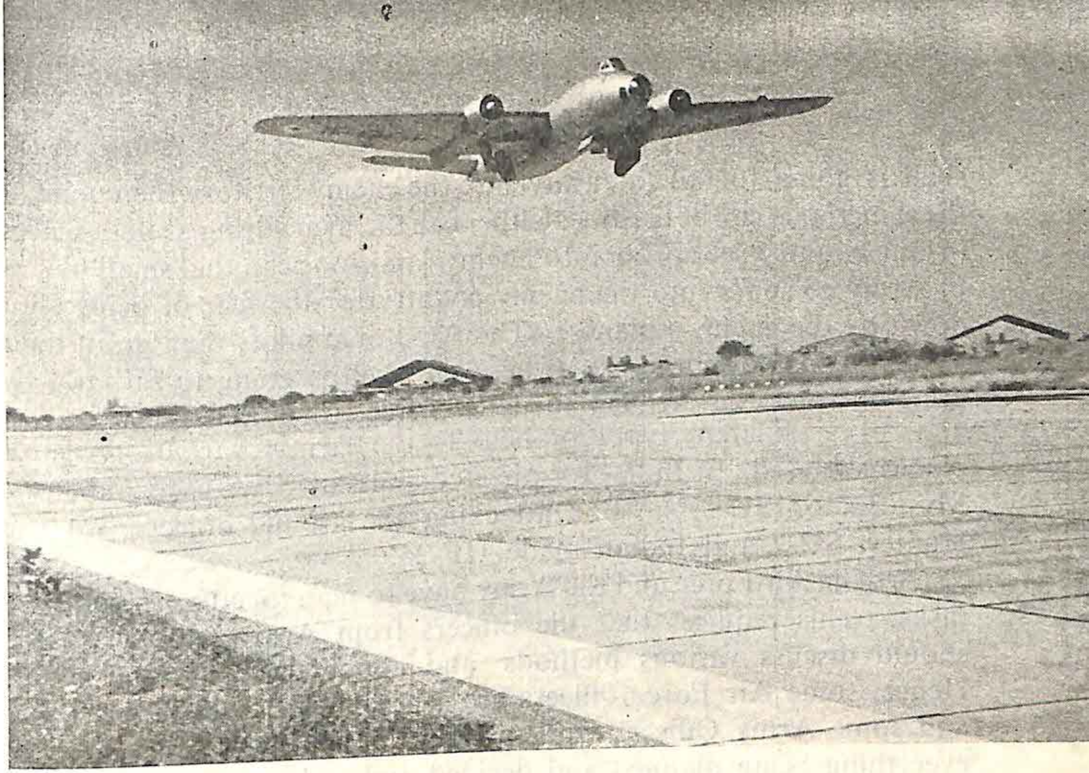


Fig. 36. Canberra bomber aeroplane

the Air Force sends aeroplanes which drop bombs or fire rockets to destroy these places.

At many places the Army may not be able to defend itself or defeat the enemy. This may be due to the enemy troops being larger in number or being better equipped. Then the Army asks the Air Force for help. The aeroplanes of the Air Force then destroy the enemy's troops by dropping bombs or by firing from machine guns fixed on the wings of the aeroplanes.

When an artillery gun fires, the shell may fall as far as twenty miles away. The man firing this artillery gun cannot see where this shell has fallen and hence cannot aim properly. In case of small guns, the Army puts men on tree tops, mountain tops or in small aeroplanes to see where the shell has fallen. These men tell the gunman over the radio to correct his aim, but when the artillery shell is going to fall far away into the enemy territory then none of these methods can be used. Neither can the men sitting at high places in our country see so far into enemy land, nor can the small planes of Army go so far into the enemy country for the fear of being shot down by the enemy's planes. The Air Force pilots then go in their jet aeroplanes over the area where the shell is going to fall and by radio instruct the artillery men to correct their aim.

For different types of help to the Army, various types of planes are used. In India, for air reconnaissance, we use Canberras, Mysteres or SU - 7's. For attacking the ground objects, we use Hunter, SU-7 and Indian made HF-24.

The Air Force and the Army have to plan together to do these tasks. This requires that the officers from Army and Air Force should discuss various methods and cooperate with each other. Hence, some Air Force officers are sent to work with Army Units and some Army Officers work at Air Force Units. This helps in everything being planned and decided and ordered quickly. Pilots are kept absolutely ready and as soon as they are given a job to do, they take off to do it. After the pilots complete their work they come back and report what has been done, so that if the job has not been completed, action can be taken.

The Air Force also gives help to the Navy. There are special aeroplanes for maritime work. These special aeroplanes search for Navy vessels and ships in distress at sea and help them with life saving equipment. For this help to the Navy, aeroplanes which can fly for a very long time are needed. In India, we use Super Constellations for this purpose.

The planes protect our ships, ports, harbours and docks in case the enemy aeroplanes or submarines attack these. The Air Force helps to destroy the naval bases and ships of the enemy. It also destroys equipment being carried by ships. Cooperation between the Navy and the Air Force is important for this work to be done successfully.

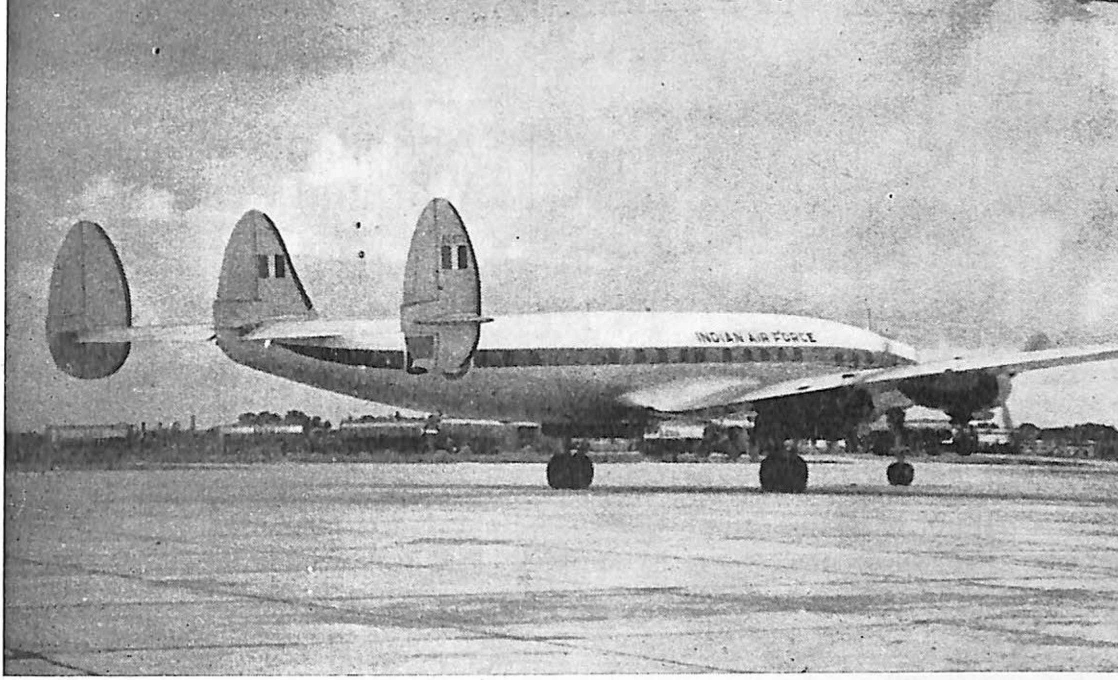


Fig. 37. Super constellation

Now you know that to fight a war the Air Force helps the Army and the Navy. They all must work together in cooperation if they want to win.

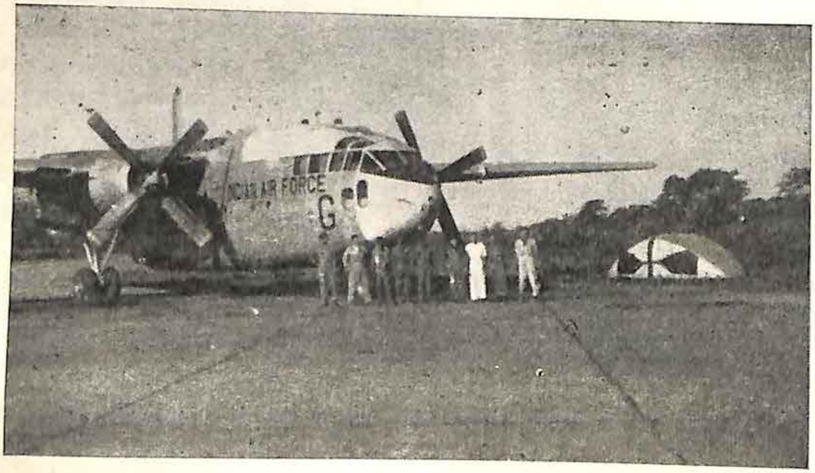
12 | Aeroplanes in War and Peace

MOST OF you must have heard of the North-East Frontier Agency (called NEFA for short), mountains of Kashmir, snow-clad peaks of Ladakh and deserts of Rajasthan. We may have to fight battles in all these places. When fighting starts, there may not be many railways or roads to carry enough supplies and men to these places. These supplies need to be taken quickly. Under the circumstances, the Air Force planes are used.

In times of peace also, there may be areas where sufficient quantities cannot be sent by road or rail. If sufficient quantities can be sent then they may not go fast enough to reach in time. Here again, the Air Force planes take these items.

Taking of supplies or men by the Air Force planes is very costly. Hence it is used only when carrying these by road, rail or ships is not good enough or fast enough to meet the needs.

Fig. 38 (a). A transport plane of the Indian Air Force



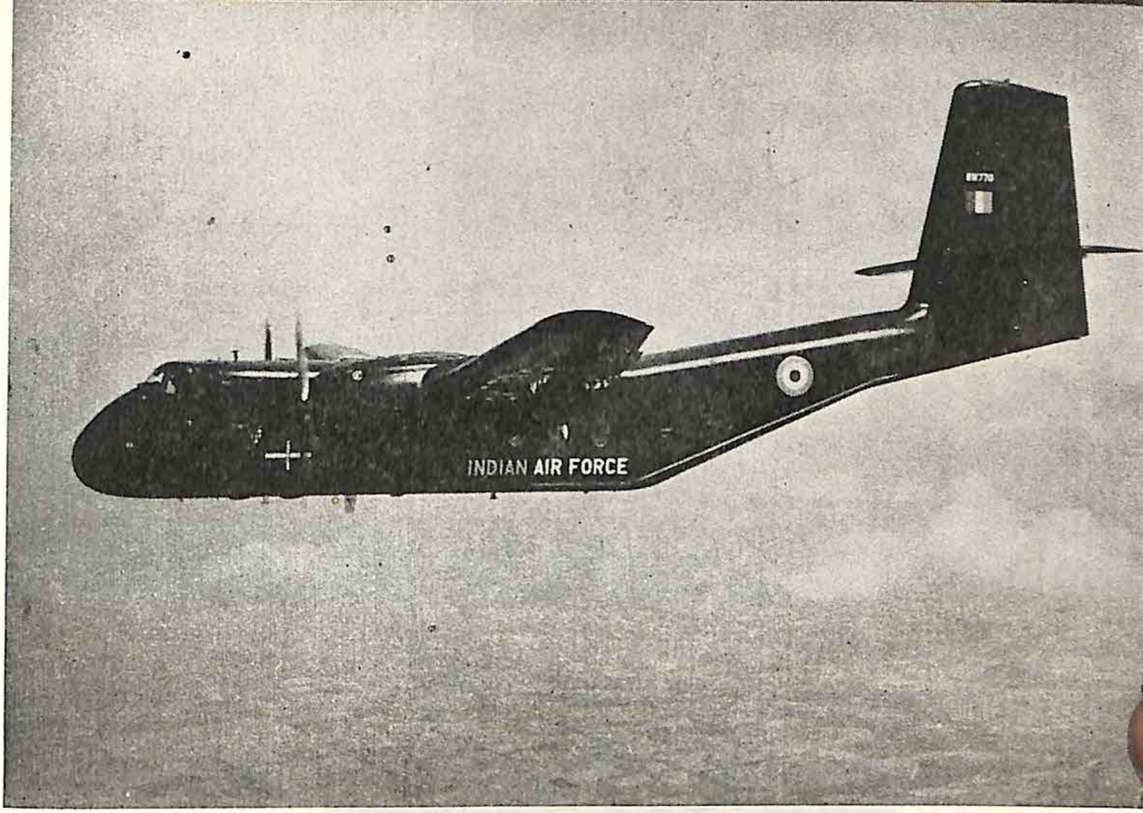


Fig. 38 (b). Caribou, another transport aeroplane of the Indian Air Force

Special aeroplanes called the transport aeroplanes are used for this purpose. These aeroplanes are looked after and flown by the Air Force, but these are used for carrying men and equipments for all the three services. Sometimes, due to special conditions, these planes may carry civilians or goods required for the use of civilians.

The Air Force planes fly the President of India, the Prime Minister and certain important officers when they have to go on urgent official duties.

You may have heard of floods and earthquakes in various parts of the country. At such times the transport planes of the Air Force help by carrying food, clothes, blankets and medicines to people in trouble. These planes also help in removing distressed people to safer places or hospitals.

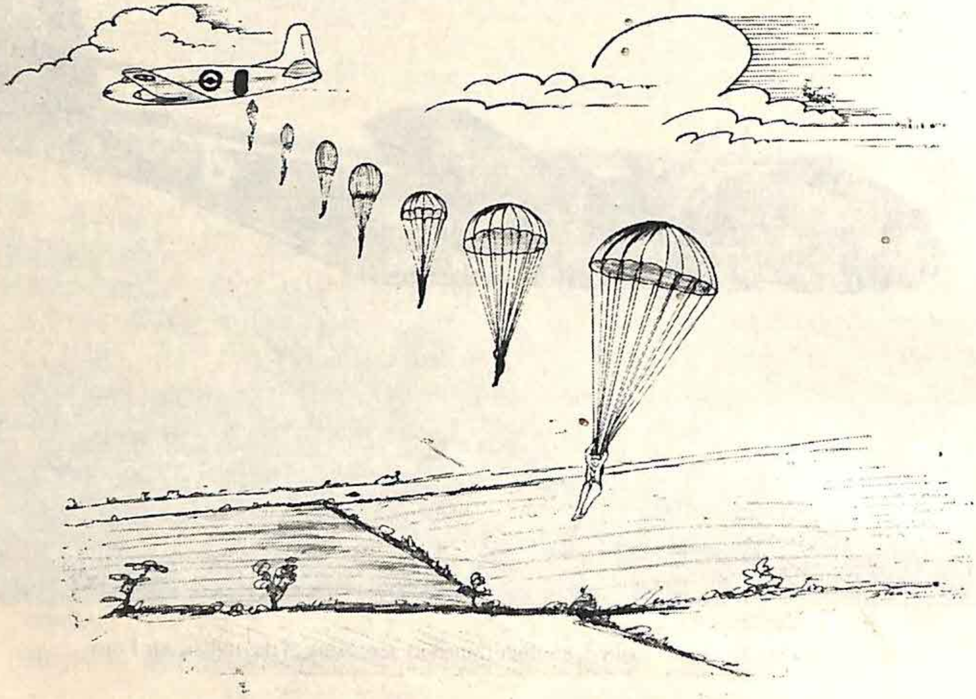


Fig. 39. Paratroopers being dropped from an aeroplane

In addition to carrying men and material, the Air Force transport planes may even carry supplies and drop them at places where aeroplanes cannot land. Certain troops called paratroopers are carried to places where they jump from the aeroplanes using parachutes.

Sometimes during a war, it may become necessary to send parties of few men either for spying or destroying some small but important places. Some men may be sent into an enemy country who would act like the people of that country and would talk to simple people in such a way that they would start disliking their government or start protesting against their government. Then

Fig. 40. A view from an aeroplane of the land below

these people would not help in the war. Such parties are usually flown by air and dropped at lonely places. They may also be supplied with food, money and equipment from time to time by air. This is done by the Air Force transport planes.

The Air Force planes, not only destroy things or kill people, but also help in carrying the sick and wounded from battle-fields or from far away places to the hospitals. These people may be taken away by helicopters or by transport planes quickly and comfortably.

In short, I have told you what the Indian Air Force has to do and how it does it. You have also learnt something about the people who do this work. If there are still some questions which come to your mind, then you will have to wait. When you grow up a little, you will be able to understand them.

Young friends, I hope you have enjoyed reading this book and are proud of what you have learnt.

National Council of Educational Research and Training